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VIEWS, NEWS AND INTERVIEWS

One day last week, about noon, a truck dished a wheel at Cortlandt street and Broadway, New York city, settled down, and blocked the southbound cable cars. The policeman on duty at that corner persuaded the truck driver to pull his wreck west on Cortlandt street, so the cable cars could pass. In the meantime, some one had notified the Metropolitan Street Railway Company's power house at Houston street that there was a break-down on the line at Cortlandt street. In a few minutes a clanging of bells was heard, cars stopped, trucks pulled up to the curb, and everybody waited, expecting a division of the fire department to come tearing down the street to quell some awful conflagration in lower Broadway. Instead, a Metropolitan wrecking wagon came loping along. The driver leaned forward with a short grip on the reins, the horses humped themselves, and a dog on the seat beside the driver barked almost as loud as the bell clanged. The wagon pulled up near the broken-down truck, the wrecking crew from their perch of vantage on the wagon sized up the situation, saw that the cable cars had clearance way and smiled pityingly at the driver of the busted truck. Then the horses of the wrecking wagon turned their heads uptown, and the episode was over—except for the man with the truck.

Readers of the ELECTRICAL REVIEW will find in the latest issue of our esteemed contemporary, *Teknisk Tidskrift*, of Stockholm, an interesting article entitled "Väg-och Vattenbyggnadsstyrelsensandagsäskanden."

Congressman John Murray Mitchell went to Sing Sing prison a few days ago to inspect the place, asserts a contemporary. Upon leaving the prison he went to the telegraph office at the depot and handed this despatch to the woman operator:

Mrs. J. M. Mitchell, Tuxedo, N. Y.

Have just escaped. Expect me home to-night. J. M. M.

"Aren't you afraid of being captured?" asked the operator, frightened almost to death.

"I trust the Western Union Telegraph Company to keep my secret," replied the Congressman. "Don't say a word to anybody."

"I promise," said the little woman.

The Congressman concealed a smile as he left the office to board the train to New York.

The Trustees of Princeton University are in receipt of a request that the electrical apparatus left by Professor Joseph Henry, and with which he made his famous experiments, be placed on exhibition in Paris during 1900. These relics were part of the Columbian Exhibition, but the Trustees have decided not to allow them to be taken to Paris. The instruments asked for are of great value because of the early date of their invention and use. Among the most important pieces in the collection are an immense magnet, capable of lifting 3,500 pounds; the original magnet with which Henry's experiments in electrical induction were tried; the magnet and hammer of the first telegraph line ever operated and wire spirals, insulated on glass cylinders, used for magnetizing needles by the electrical discharge.

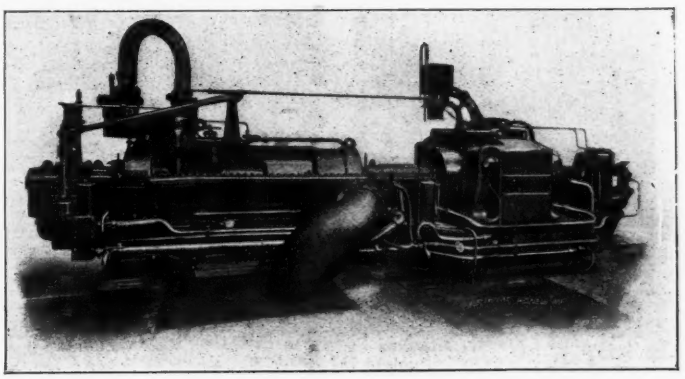
The demand for incandescent lamps has so increased that at present the industry represents an output of millions a year. In fact, it is reported that one large concern has turned out 8,400,000 lamps for the year ending January 31, 1899. Taking twenty large cities in the Union which average up 3,000,000 lamps apiece a business is carried on each year of over 60,000,000 and possibly 100,000,000 incandescent lamps. What will the figure be when the great masses use electricity for light in place of gas?

Mr. Benjamin Hunting Howell, who has been for a long time associated with Messrs. R W. Blackwell & Company, Ltd., of London, has been made a director in that concern, it having lately been incorporated as a stock company. Mr. Howell is an American, born in New York city, and has the distinction of holding the "diamond sculls," a badge proclaiming him the champion oarsman of the Thames.

In 1883, three now famous men were at the University of Strasburg—Roentgen, Paderewski and Tesla. Then Roentgen was a professor of physics, Paderewski was an instructor in music and Tesla was installing the electric light plant at the University.

Excavation of the canal for the power plant at Massena, in St. Lawrence County, N. Y., was suspended on the first of December for the Winter. Construction has also stopped on the power house. The contractors will employ a number of men in other ways during the cold months.

France is said to be planning the creation of six railway regiments, recruited among railway employés and drilled in running trains, track work, telegraphy and telephony.



A STEAM TURBINE ALTERNATOR.

A Steam Turbine Alternator.

The illustration shown herewith represents a type of direct-coupled steam turbine-driven alternator, which is now being installed in the station of the Newcastle & District Electric Lighting Company, in England. The machine was built at the Heaton Works of the Hon. C. A. Parsons, well-known in engineering circles as the inventor of a type of steam turbines, and the constructor of that remarkable craft the Turbinia, which to-day holds the record for speed in steam navigation. The machine shown in the illustration comprises a 500-kilowatt four-pole alternator, giving a normal output of 250 amperes at 2,000 volts when running at 2,700 revolutions per minute. The current is single-phase at a periodicity of 90 cycles per second. An exciter is mounted on a main shaft and is arranged to give 24 amperes at 88 volts, or only 0.4 per cent of the output of the main machine. The governor is of the construction that has been in use from the beginning of the Parsons's steam turbine, and consists of a solenoid connected in shunt to the terminals of the exciter armature. Alongside of this is a thick wire coil in the main circuit, acting in opposition to the shunt coil, so that the steam controlled by the differential action of the two is admitted in longer or shorter pulses to the turbine. This machine is one of a type of which several are under construction for various lighting plants in England and on the Continent. Two larger machines, of 1,000 kilowatts each, are under construction for the municipal lighting station in Elberfeld, Germany. The engineer accustomed to the lower speed of the older generation, finds it difficult to reconcile his ideas with a machine of over 600-horse-power, running at the enormous speed that this apparatus displays. But the operation of the machine is said to be noiseless, steady and satisfactory, while the regulation is as close as two per cent at the terminals with the extreme variations of load. Of course the machines can be over-compounded for increased voltage with rising load,

There will be installed upon H. M. S. Viper, the new torpedo boat destroyer of 10,000 horse-power and estimated 35-knots speed, which is now under construction for the British admiralty, a very compact lighting set, consisting of a direct-current dynamo, coupled to a turbine and running at 4,000 revolutions per minute. The output of this little machine will be 100 amperes at the standard naval electric lighting pressure of 80 volts.

In the machine shown in the illustration a surface condenser is built into the bed-plate, and the air pump and circulating pump are mounted on the frame of the turbine and driven by means of worm gear from the main shaft. A similar gearing furnishes power to an oil pump, which supplies forced lubrication to the various moving parts. A runaway governor of the centrifugal type is attached to the set, so that the speed can never reach an excessive limit in case of accident. This machine is not only interesting for the peculiar qualities which it exhibits, but as well for the fact that it is doubtless a prototype of the electric lighting generator of the future. It is said to have shown a remarkable economy of 23.2 pounds of steam for kilowatt-hour on a test which included an overload of 85 kilowatts. We are indebted to our British namesake for the illustration of this very interesting piece of apparatus.

May Bid for the New York City Tunnel Road.

It was announced last week that a bid for the construction and operation of the underground rapid transit railroad in New York city probably will be submitted by the National Street Railroad Construction Company, a corporation organized some time ago with that special object in view. The corporation has now a capital stock of only $5,000, but has the privilege of increasing it, should it be decided to enter the competition for the tunnel railroad contest. Among those interested in the company are Mr. H. M. Littell, the well-known street railroad man, and Mr. James P. McQuaide, treasurer of the National Conduit and Cable Company, of New York city.

It is understood in Boston that a large amount of bonds is likely to be issued by the American Telephone and Telegraph Company (long distance), which has lately taken over the American Bell Company. Amounts ranging from $100,000,000 to $150,000,000 are discussed, to bear 4 per cent and to run 30 years. An issue of $5,000,000 is said to be in course of preparation for issue.

NOTES ON LIGHT.

BY WILLIAM ROLLINS.

NOTE LXXVI—THE BUILDING OF A VACUUM.

Building has been very expensive, for the trusts have raised the price of materials. As I was fond of construction and poor, I took to building vacuums, as they needed so little material, not much more than castles in the air.

Those who have had experience with X-light tubes excited by powerful generators have observed, among others, the following phenomena: When they got a tube from the makers and excited it, the vacuum would fall until a long spark-gap in series had to be used to make it economically produce X-light, or perhaps it fell so far that the tube had to be returned. The cause of the fall is that the stress has driven gas into the tube. When the tube comes back, after repumping, it will stand up better, and after it has been run a long time the opposite effect appears, namely, the vacuum is so high when the tube is cold that heat must be used before starting it to avoid punctures. Then, after more use, a stage is reached when heat is not effectual. Next the potash bulb is heated. After a time this method also fails to lower the vacuum. Then the tube is sent to be repumped. After that it will run for a while, but the appearances are different. We may lower the vacuum again with potash, but there is little X-light and the color of the glass is dull. We may send the tube back again for repumping, but never again is it a good tube. What is the reason? It is this: Hydrogen is practically exhausted from the cathode. No more can be sent out except under greater stress from a more powerful generator, and if so sent out and X-light generated it will go back again, enough so that the smaller generator can not light the tube. The following experiment proves this exhaustion: Put a new tube on the pump and exhaust it hot while lighted, until no X-light is given off. Then by harmonic vibrations start the cathode stream and keep it going as long as possible, continuing the pumping until the light dies out. Now introduce any of the ordinary gases except hydrogen and lower the vacuum. You can then start the cathode stream and get a little light. Continue the pumping until the light fades and introduce more gas. In this way you will arrive at the same result in a few hours that is got in practice by long use. The tube is old and useless. Now introduce hydrogen by the electrolytic regulator. This can be done for an hour without appearing to lower the vacuum much, for it is absorbed by the cathode. This can be proved in the following way: As soon as enough has gone in to enable the cathode stream to start, keep the tube lighted, that is, keep the cathode expiring hydrogen so this hydra mouthed monster can not swallow the fresh supplies. Then it will be seen that the vacuum is falling and it will come down to a lovely rose-pink mixed with blue. After a time the tube can give as brilliant results as a new one. This experiment would therefore appear to show that all that was needed to make new lamps from old ones was hydrogen, and this is so, though for practical purposes a pure hydrogen vacuum may not be as good as some other kind as the following experiment will show: Exhaust a tube as above until it reaches old age, introduce hydrogen until the light is brilliant, keep the tube lighted and on the pump Practically the only gas in the tube is hydrogen, as the other gases are pumped out after a time. Such a tube is not practical for all generators, because the vacuum when cold goes up too high to start easily on a small generator, for the hydrogen is absorbed when the tube is at rest, and is then too high to start readily, or if a great amount of hydrogen is in the cathode, so the tube starts easily, then it quickly runs down in use until it requires long spark-gaps in series to make the hydrogen strike the target with a sufficient velocity to produce X-light. What we want then is some stable gas which will not be readily absorbed to form what I call a groundwork vacuum. We are accustomed to think of nitrogen as an inert gas, so I tried it only to find that under these conditions it was anything but stable. Carbonic anhydride was not permanent. Oxygen was very interesting but not perfectly satisfactory. I mention some oxygen phenomena. A tube was made with a regulator like that shown in Note 1, Fig. 52, which allowed me to introduce either hydrogen or oxygen. The tube was pumped while excited until extreme old age came on. In other words, it was put through the same treatment our civilization puts us through. Oxygen was then repeatedly introduced until the vacuum was supposed to be mostly of this gas. The tube was then excited and a

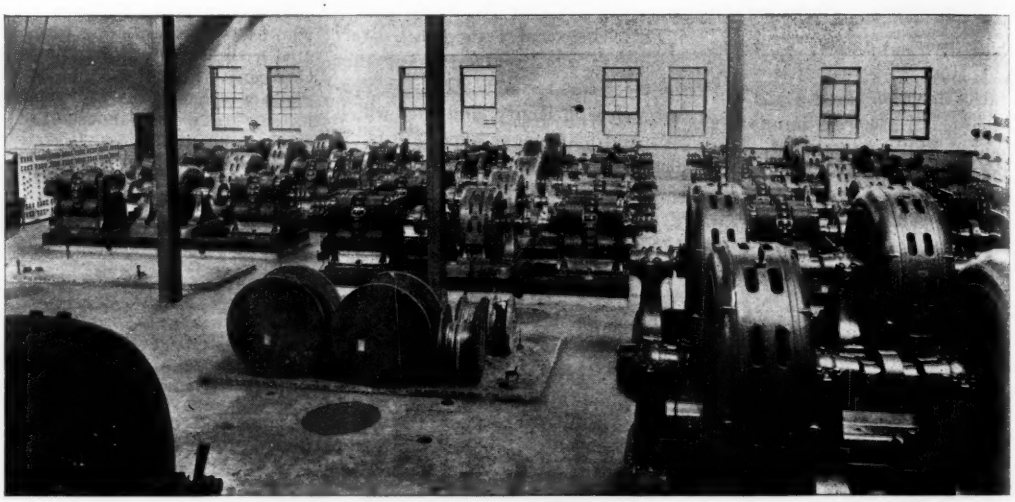


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FIG. 1. NIAGARA POWER IN BUFFALO BUFFALO GENERAL ELECTRIC LIGHTING STATION.

stream of hydrogen sent in. After an hour the vacuum was no lower. What had become of the hydrogen? It had not gone into the cathode, for this was kept busy sending out gas. We are accustomed to think of the union of hydrogen and oxygen as one of explosive violence, so for some time I did not realize what was happening; but a little heat applied to the glass quickly told the story, for the vacuum went down with a rush. Here then was this exothermic reaction going on under the electric spark quietly. No permanent gas was found perfectly suited for a ground vacuum, and having learned by sad experience how hard it was in spectrum analysis to get rid of water vapor, it seemed a pity to part such good friends as glass and water, so I tried to make some practical use of their affinity rather than to break it, for while friendship is the music of life, the sound of its parting strings is life's most tragic note, which leaves a hopeless discord that I wanted to avoid in vacuum tubes though I could not in my life. The experiment was successful as they generally are if one follows his intuitions. Therefore two regulators may be put on one tube, one to introduce hydrogen and the other water vapor.

NOTE LXXVII—THE A-W-L VACUUM REGULATOR.

In previous notes various ways of regulating the vacuum have been mentioned, and, in Note lxii, Fig. 57, the electrolytic regulator was shown. Between having a device so that it is satisfactory to demonstrate a principle, and making it cheap enough to be commercially available, there is frequently a long road, so I have devoted some time to making this regulator in a cheap form. Seamless platinum tubing was obtained from Baker, with a bore of 50/1000 of an inch and walls 15/1000 of an inch thick, in pieces one inch long. One end of a piece was closed with palladium 3/1000 of an inch thick, soldered on with gold.

In this form the regulator is cheaper than my platinum heat regulator, for this tube must be two and one-half inches long, and even then the glass will crack unless some care is used. If the short piece of tube after attachment to the vacuum tube is placed in the feeder shown in Fig. 57, already mentioned, and this filled with water, it is only necessary to send a current of sufficient strength through the water to decompose it, to cause hydrogen to go either in or out of the tube according to whether the palladium is the positive or negative pole. If there is an Edison 110-volt current near, the simplest way is to connect cords with a lamp socket and put two 16-candle lamps in series, one on each wire, leading the wires to the feeder.

If the street current is not available, then a few dry cells in a portable box answer every purpose.

Niagara Power in Buffalo.

The extension of the Niagara power service in the city of Buffalo has been very great of late. In August, 1899, the entire city was for the first time lighted by the Niagara Falls power. The illustrations shown herewith represent two of the power applications in the city. Fig. 1 shows one of the substations of the Buffalo General Electric Company, where 3,000 horsepower of the Niagara energy is transformed and redistributed for electric lighting. As will be seen from the illustration, the greater part of this power is used for driving large arc lighting dynamos through the agency of synchronous motors. Fig. 2 shows an enormous crane at the Union dry dock. The whole plant of the company controlling this dock is operated by electrical power. The distributing system is very complete, as each machine has its independent motor. As the entire system is practically out-of-doors and subject to the action of the weather, the plant is justly regarded as a severe test of the ability of an electric motor to work under trying conditions. The crane shown in the illustration has a capacity of 40 tons and covers a large area of the dry dock and adjacent landings. It is a modification of the gauntry type, the suspended crab having a run along the under side of the main crane girders from one dry dock to another, and the whole machine traveling sideways along the steel trestle arranged between a pair of docks.

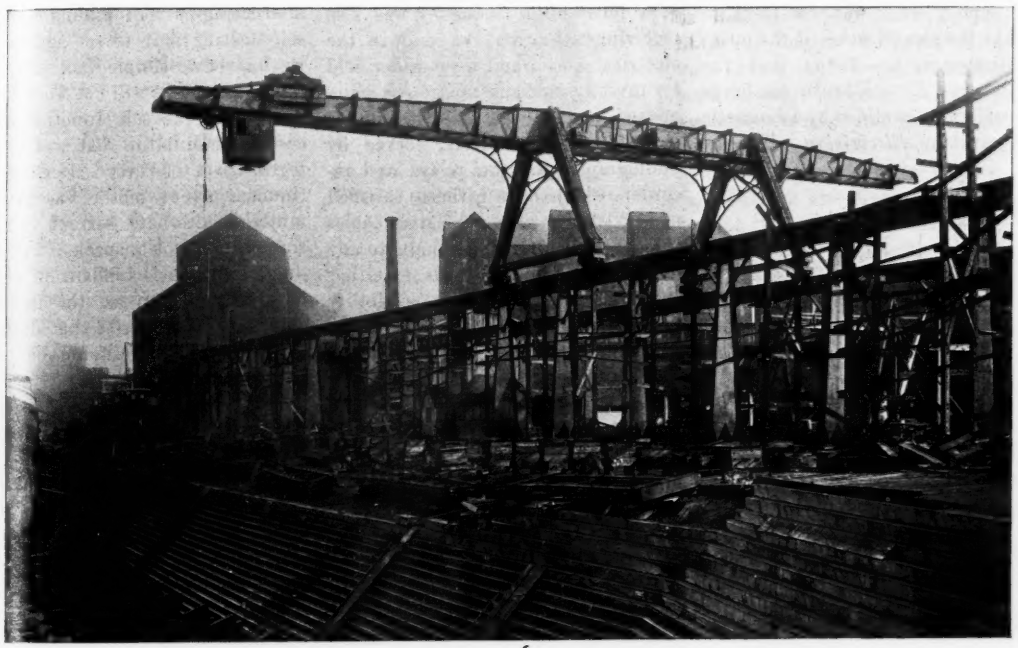

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FIG. 2.—NIAGARA POWER IN BUFFALO—THE GREAT CRANE AT THE UNION DRY DOCK.

PERSONAL.

Professor R. B. Owens, of McGill University, Montreal, visited New York city last week.

Mr. S. M. Hamill, of the General Electric Company, Schenectady, N. Y., visited New York city last week.

Mr. Henry Hine, general manager of the Stanley Electric Manufacturing Company, Pittsfield, Mass., was in New York city last week.

Professor Charles R. Cross, of the Massachusetts Institute of Technology, will give a series of Lowell lectures on "The Telephone," beginning on December 19.

Mr. E. J. Hathorne, receiver for the Fort Wayne Electric Company, was recently by order of court given the electric lighting plant at Murfreesboro, Tenn., and $5,000 as a fee. The Murfreesboro plant was owned by the defunct company.

Major Loren N. Downs, for years widely known in the telephone field, and more recently identified with electric railway interests, will remove to Philadelphia shortly and assume the presidency of the Railways Company General. Major Downs is the president of the Michigan Traction Company, of Kalamazoo, Mich., which company recently passed into the control of the Railways Company, and is a very wide-awake and progressive representative of the electrical traction industry.

Mr. J. Elliott Smith, superintendent of telegraphs for the New York City Fire Department, has sent his resignation to Commissioner Scannell, who has accepted it. The resignation is the result of a compromise. When Commissioner Scannell took charge of the department he abolished Mr. Smith's office. Mr. Smith appealed to the courts and, as announced in the ELECTRICAL REVIEW last week, won his case. Mr. Smith will receive back pay up to the time of his resignation, and the department telegraph bureau will remain under the charge of Chief Croker.

Death of Charles J. Clarke.

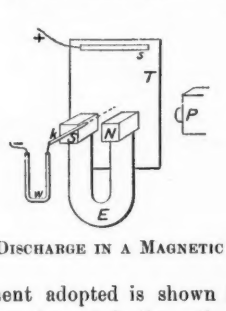
Charles J. Clarke, one of the best-known citizens of Pittsburgh, died at his residence in that city on November 5, of concussion of the brain, the results of a driving accident. He was prominent in municipal affairs, a financier, horseman and a man of large means. He was a former director and, at the time of his death, a large stockholder in the Phœnix Glass Company, of Pittsburgh.

SCIENCE BREVITIES.

Secondary Radioactivity—M. and Mme. Curie have discovered and described before the Académie des Sciences, says one of Mr. Fournier d'Albe's abstracts, an important new property of radioactive substances. The rays emitted by radium and polonium are capable of communicating a temporary radioactivity to otherwise inactive substances, such as zinc, platinum, bismuth, paper, barium carbonate and bismuth sulphide. The property may be exhibited by mounting a plate of the neutral substance over a powdered radium compound, and removing it from time to time to test it by the air-conductivity apparatus. The acquired radioactivity increases with the exposure and diminishes after exposure, rapidly at first and then more and more slowly. Operating with radioactive substances possessing from 5,000 to 50,000 times the radioactivity of uranium, the secondary activities amounted to from one to fifty times that of uranium. After two or three hours the activity was reduced to one-tenth of its original amount. In favorable circumstances the induced radioactivity may be severel hundred times that of barium. The authors have proved that it is not due to traces of radioactive substances in the neutral plate, nor to vapors of the radioactive substance. The phenomenon is allied to phosphorescence rather than to the production of secondary Röentgen rays, as the latter are extinguished immediately on cessation of the original rays.

Electrolysis of Fused Zinc Chloride—The following is an abstract of an interesting paper by Mr. H. S. Schultze, which appeared in the *Zeitschrift der anorg. Chemie*. The abstract is taken from the London *Electrical Engineer*. "When fused zinc chloride is electrolyzed with carbon electrodes, chlorine is evolved at the anode and hydrogen at the cathode, whilst the electrolyte is rendered cloudy by the separation of a bluish-grey substance. After a time the evolution of hydrogen stops, zinc is deposited instead, and the separation of the bluish-grey substance ceases. The author has observed the same phenomena when a piece of the purest zinc is introduced into fused zinc chloride; thus the cloudiness of the latter can not be due to the carbon electrodes. Zinc chloride obstinately retains traces of water, and this probably reacts with zinc according to the equation $Zn + H_2O = ZnO + H_2$; analysis confirms this, and shows that when the action continues the zinc oxide contains an excess of zinc beyond that required for ZnO, whence the darkening in color. A specimen of zinc chloride which evolved hydrogen, but from which zinc oxide did not separate, was found to contain hydrochloric acid. According to the method of preparation, zinc chloride may contain water or hydrochloric acid, and of these only the former interferes with a smooth electrolysis of the fused salt."

Spark Discharge in a Magnetic Field—M. Toepler, who was the first to describe the stratification of the open-air discharge, has found that the stratification of the brush discharge is considerably modified by a magnetic field, says the *Electrician*. The arrangement adopted is shown in the diagram, where *k* is the cathode, attached to a high-water resistance *w*; T is the anode, consisting of a slate to which a strip of tinfoil *s* is attached. SEN is the electromagnet, and the discharge is observed or photographed at P. The magnetic field has the effect of crowding the stratifications together, and also of displacing them laterally with respect to each other. An unstable brush discharge is converted into a spark discharge by the magnetic field.



SPARK DISCHARGE IN A MAGNETIC FIELD.

Spectrum of Radium—M. E. Demarçay has studied the spectrum of radium in specimens supplied by M. Curie, containing increasing proportions of the radioactive substance. He found, according to his communication in *Comptes Rendus*, that certain lines increased in prominence in successive samples, and as these lines were hitherto unknown, he is safe in ascribing them to radium. They are 15 in number, the brighest being at λ=3814.7, 4683.0, 4340.6, 3649.6 and 4826.3. The line 4627.4 is the centre of a peculiar nebulous band. The other lines are sharp, like those of barium, which are all present and strongly marked. The author has not finished the study of the less refrangible portion.

BRITISH NOTES.

[*From our special correspondent.*]

The sick room is not the best possible position for viewing the progress of electrical science, and I fear that what I have to say this week will not be of a specially enlightening character.

A remarkable address, given by Professor Silvanus P. Thomson, the new president, has excited a good deal of attention. He had much to say on the increased use in telegraphy of automatic methods of sending, and the extension of the use of automatic transmitters in cable service; the use of alternating currents of a fairly high frequency was also receiving attention, he said, in the electrical world, and a yet wider field for investigation and progress is being opened out by the substitution of delicate optical receivers, worked by photography, for the relays and recorders which have hitherto satisfied us. With regard to submarine cables the old difficulty will remain to any improvement in apparatus at either end of the cable from the impossibility to be able to overcome the sluggishness inherent in the cable itself, or at least in those cables constructed on the traditional pattern. In 1893 he himself had suggested that a cable should be constructed with a series of self-inductive artificial leaks of high resistance distributed along its length to combat its distributive capacity; but the proposal was too radical an innovation for our authorities to accept it. Proceeding, he noticed, that it was singular how the properties of the rare earths which form the foundation of the invention in the Welsbach mantle had not been turned to account in electrical illumination before the invention of the Nernst lamp, for the commercial introduction of which, by the by, electrical engineers are still apparently waiting. In the meantime, however, a far more important factor in the economical struggle remained in the reduction of the high prime cost of electrical wiring, could this be reduced to a reasonable figure, what an enormous advance might be confidently expected, but so long as station engineers and fire insurance inspectors combined to insist in the present expensive and unnecessarily safeguarded system, so long would this advance be delayed. In the public distribution of electrical energy a useful revolution was being affected. Ten years ago a distribution at six miles from the generating station was regarded as the dream of an enthusiast, to-day it is clearly recognized that the secret of economic working is to generate on a large scale and to distribute over large areas at a properly high voltage. The great superiority of alternating currents for motive power and long-distance work was becoming more apparent every day; though there are, of course, special forms of work for which the continuous-current line is appropriate, this last applies especially to electrolytic work with all its rapidly multiplying applications in the economical industries. It is not long since alternating currents were descried, on the alleged ground that alternating-current motors were not self-starting; but to set against this we have the simple fact that continuous currents will not work motors at all, and the sole function of the costly commutator that was the integral part of every socalled continuous-current motor was to commute an alternate current in a continuous one, not to speak of the introduction of risks attendant on the use of brushes, which led the insurance companies to prescribe that all motors with commutators should be put in fireproof enclosures.

The name of Professor Silvanus Thomson must be nearly as familiar to you as it is to us. He is a capital writer and speaker, and would probably have made his mark as a literary man had he cared to do so; in this connection I may refer you to his "Life of Faraday," which is quite a "master-piece" of its kind and delightful writing.

Manchester is the latest recruit to electric traction; they propose to borrow £800,000 for the purpose of reconstructing their horse-tramway system and converting it into an electric one; 600 cars have been ordered, a great car-shed, which will accommodate 250 cars, is being arranged for, and other preliminary works started. At the board of trade inquiry the City Electrical Engineer recommended the adoption of the overhead trolley system, as that best suited to the exigencies of their local traffic, with a single trolley wire and using the rails as a return.

At the Institution of Civil Engineers, Mr. Dalrymple-Hay read an important paper on the Waterloo & City Railway, which you probably know is an electrical line. I do not know that he had very much that was new to tell us, the importance of the paper consisted more, perhaps, in its setting and the grouping of its contents, but it is no small matter to have this well done; scientific writing is so often lacking on the literary side and quite unnecessarily so.

A NEW AUTOMOBILE FUEL—ELECTROLYTIC ALCOHOL.

A NEW ELECTROLYTIC PROCESS FOR MAKING ALCOHOL—AUTOMOBILISM IN RUSSIA—POSSIBILITIES OF A LOW-PRICED AND ODERLESS FUEL.

Dr. George H. Benjamin, of New York, has recently returned from an extended visit to various European countries, including Russia, and has described to a representative of the ELECTRICAL REVIEW the state of the automobile art in Russia, with especial reference to the growing use of alcohol as a fuel for explosion motors in that country. Dr. Benjamin says that in Moscow and St. Petersburg heavy automobile trucks, carrying loads up to four or five tons, are in constant use, their motive power being derived from alcohol motors, and that this fuel—almost absolute ethyl-alcohol—can be made according to the Villon electrolytic process for about eight cents a gallon.

The Villon process is a recent addition to the number of synthetic methods made possible by electrolysis and its products, and results in the manufacture of a very pure alcohol—primarily from limestone rock and coke. The method of manufacture is as follows: Calcium carbide is first produced in the usual way by subjecting ground quick-lime and coke in intimate mixture to the flame of the arc in an electric furnace. This carbide is used for the production of acetylene. The subsequent steps can best be understood by reference to the illustration Fig. 1, which shows in diagram the various steps in the manufacture. In the vessel at the extreme left the calcium carbide is placed with a sufficient quantity of water to decompose it with the formation of common lime and acetylene gas. This gas is carried over by the pipe to the next vessel, where it bubbles through, and is absorbed by a reducing salt of the general type of chrome sulphate of the protoxide variety, a double sulphate of chromium and ammonia being an excellent mixture. The strength of this solution is such that in the absorption of the acetylene a quantity of hydrogen, by weight equivalent to about 10 per cent of the acetylene, is generated in the reaction. The general effect of the reaction is the formation of ethylene gas and the reduction of the chromium oxide to a lower type. In practice it is found preferable to heat the solution of the chromium salts to a temperature of, approximately, 40 degrees Centigrade, though it is not essential. The reducing salt is brought back to its former condition by the action upon it of nascent hydrogen, which is most conveniently produced by some electrolytic arrangement such as that shown in the figure. The positive electrode, as will be seen, is enclosed in a tube which is open to the air, allowing a vent for the oxygen set free. The ethylene produced in this stage of the process is led off by the pipe shown in the figure to an absorption apparatus, as indicated at the right. This consists of a series of cells, which are shown in detail in Fig. 2, arranged in progressive order downward, and filled with sulphuric acid, which constantly flows in from a suitable receptacle at the top. The ethylene gas bubbles through the cells in series, and is totally absorbed by the time it reaches the top of the line. The combination that is formed by this absorption is hydrogen-ethyl-sulphate which gradually works its way down to the retort shown at the foot of the series. To this is added about one-third of its weight of water and the whole is heated by suitable means, the effect being that the hydrogen-ethyl-sulphate is decomposed, ethyl-alcohol passing off and being condensed in the condensation apparatus shown at the extreme right of the figure. After the ethyl-alcohol has been distilled off, the fluid left in the retort is sulphuric acid which it is possible to use over again in the process. The general result is that ethy-alcohol of extreme purity is produced and naturally is not accompanied by the various other oils, ethers, etc., which are the by-products of fermentation and are encountered in the ordinary alcohol of commerce. The materials consumed, as will be seen, are water, calcium carbide and hydrogen. As the carbide sells for less than $20 per ton in Russia, the result is that the process is exceedingly cheap, and alcohol of a very high grade and quite odorless is produced.

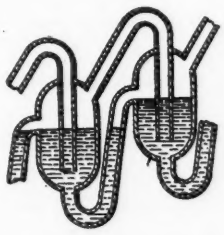


FIG. 2.—ABSORPTION PIPE USED IN MAKING ELECTROLYTIC ALCOHOL.

In comparison with any petroleum product this fuel possesses enormous advantages of cleanliness and freedom from all disagreeable odor. To prevent such alcohol being fraudulently used for other than its intended purposes, it is usual to add to it a flavoring of some of the amyl compounds which give it a nauseous taste, making it impossible to use it in the manufacture of liquors, yet not impairing its usefulness as a fuel.

Dr. Benjamin says that the use of the automobile is rapidly spreading in Russia, while in France, which may almost justly claim to be the country of its origin, it is not making the progress that its friends would desire. He described also a new method of making accumulator plates which has been practiced with great success in Russian cities. The lead grid is filled with a mixture of lead protoxide, lead chloride and diatomaceous earth—the remains of fossil infusoria and one of the most highly absorbent materials known. As this porous matter is entirely unaffected by acids, the result of the mixture is the formation of plugs of very permeable character which, it is said, are strong mechanically and resist well any tendency to shake out or buckle in use.

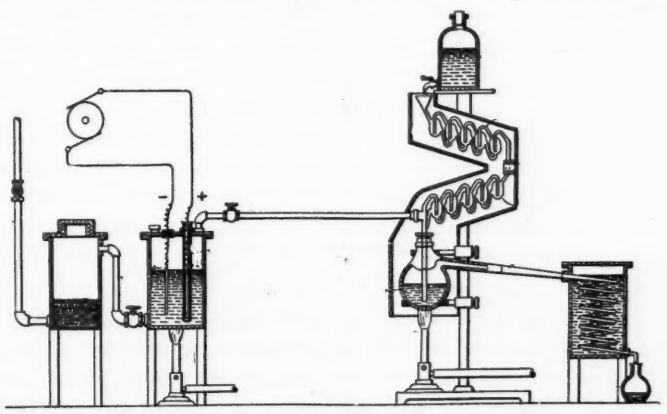


FIG. 1.—APPARATUS FOR MAKING ELECTROLYTIC ALCOHOL.

Referring again to the status of automobilism in France, Dr. Benjamin said that the steam machine possessed many features which commended it, while considerable progress is being made in the curious direction of working automobiles by compressed air. A method of reheating this air has been devised, consisting of a small dynamo attached to the main motor, and sending its currents through coils of resistance wire in the path of the air flowing toward the engine. The effect of this arrangement is to utilize a part of the developed energy of the air in heating that which comes into the cylinder to prevent the freezing of the valves and in general to secure better working. While this arrangement is interesting it certainly does not look very practical.

It is greatly to be hoped that if any form of explosion-motor automobile ever gains accendency in the United States it will use the alcohol fuel. Those who have been in Paris since the general use of the automobile in that city will probably at once recall two unpleasant memories—the tooting of the signal horns carried by the machines and the intolerable stench of half burned petroleum compounds which they leave behind, like the trail of an evil comet. One difficulty that stands in the way of the adoption of alcohol motors in the United States is the stringent internal revenue regulation, which taxes that material to a degree prohibiting its use except on a small scale and under particular circumstances. Crude alcohol of the ethyl variety may be made cheaply in the United States, but the internal revenue tax upon it amounts to $2.14 per gallon.

Foreign Notes of Interest.

It is reported that the Chilian Government is arranging for the installation of the wireless telegraph system to Punta Arenas across the Straits of Magellan.

According to a newspaper cablegram from Paris, December 4, the French Government has announced a reduction in the annual rentals of Paris telephones to $60. Calls from public pay stations are to be three cents each. Each town, it is said, is to be connected with Paris by long-distance lines.

It was reported on November 28 that the length of cable from Zanzibar to Aden was again broken. This left, at the time. only the slow working, system up the African west coast, over which all the great volume of business pertaining to a time of war must go. The cable was repaired and in working order on December 3.

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CHARLES W. PRICE, - - - - - - - EDITOR.
STEPHEN L. COLES, - - MANAGING EDITOR.
CHARLES T. CHILD, - - TECHNICAL EDITOR.
STEPHEN H. GODDARD, ADVERTISING MANAGER.

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NEW YORK OFFICE:
RUSSELL HOWLAND, GENERAL REPRESENTATIVE,
Times Building, 41 Park Row.

WESTERN OFFICE:
FRANK E. COLBERT, REPRESENTATIVE,
955 Old Colony Building, Chicago.

WASHINGTON OFFICE:
GEO. C. MAYNARD, - REPRESENTATIVE,
Room 102, Washington Loan and Trust Building,
WASHINGTON, D. C.

LONDON OFFICE:
HENRY W. HALL, - - REPRESENTATIVE,
42 Old Broad Street, LONDON, E. C.
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CONTENTS.

Views, News and Interviews 371
A Steam Turbine Alternator 371
May Bid for the New York City Tunnel Road 372
Notes on Light 372
Niagara Power in Buffalo 373
Personal 373
Death of Charles J. Clarke 373
Science Brevities 374
British Notes 374
A New Automobile Fuel—Electrolytic Alcohol 375
Foreign Notes of Interest 375
Concerning Our Neighbors' Tastes 376
Steam Turbines for Dynamo Driving 376
Lightning—The "Dark" Flash 377
Electric Railway Notes 378
New York City Street Railway Elections 378
How Not to Get Foreign Trade 378
News From the Seat of War 378
Tramways in Manchester 378
Roentgen Rays and the War in South Africa 379
Football and Industry 379
Electric Lighting Transformers 379
Automobile Notes 379
A New Electrolytic Alkali Process 379
Commercial Cable Company 379
The Highest Aim of the Physicist 380
Incandescent Lamp Accessories 381
Reestablishing Telegraphic Communication 381
Village Lighting in Spain 381
A Prejudiced Opinion 381
Australian Copper 382
Literary 382
Electric Light Flashes 382
Electric Roads Along Niagara River 382
Telephone News and Comment 383
An Electromagnetic Separator 383
Wall Street and the Electrical Stock Market 384
Imported Carbons 384
Book Reviews 384
More Underground Trolley Cars in New York 384
Bullock Company to Extend its Plant 384
Telephone Protection Instruments 384
American Electrical Apparatus the Best in the World 384
Business News 384
Recent Electrical Patents 385
A Neat Application of Electric Power 385
Meeting of the American Society of Mechanical Engineers 385
X-Ray Tubes With Artificially-Cooled Apparatus 385
The Direction of Electrical Advance 385
A Beautiful Catalogue 385
Advance Information 386
Kindred Interests xvii
Electrical Patents xviii

Advertisers' Alphabetical and Classified Index on page xiv.

CONCERNING OUR NEIGHBORS' TASTES.

A gentleman who has traveled much and has a very large interest in American export trade said, in conversation the other day, that the principal drawback to a wider extension of American commerce in certain parts of the world is that manufacturers in the United States do not sufficiently study the wants, the customs and the tastes of their prospective customers. "For example," he said, "a certain American firm sent some electrical goods, which were decorated in green, to Japan. They did not sell any. No Japanese would bring such things into his house; it would mean an invitation to the evil deities. Green is an evil color in Japan. What a Japanese wants is red things. Upon this simple matter of color rested the failure of that manufacturer to succeed in export trade."

A German employer of labor said: "I like American machines so far as their performance of their work is concerned, but they demoralize my men. They come here in sober colors of paint and with no bright parts. The men who tend the machines do not have any brass to keep clean, or any surfaces to rub, and they get lazy. The German workman needs to be kept busy with things of this sort."

Here, now, are some practical instances of what the American manufacturer must learn before he can attain the widest success in the new field of foreign trade. Do not send to Germany catalogues in the English language, or to Japan things decorated in green, or to the Isthmus of Panama anything with blue spots on it. Make the foreign machinery buyer understand that every part of every machine is replaceable and interchangeable with others. Study the characteristics of the people to whom the goods go, and, instead of laughing at their prejudices, turn them to advantage. Take especial care in the packing of export goods, both to insure against breakage, and because of the fact that certain people wish goods packed in a certain way. In some parts of the world economy is so closely observed that the nails are drawn from packing cases and the lumber used over. To these people the proper sort of lumber and the right kind of nails should be sent. It looks as if we need in this country a commercial kindergarten in which such information as the above may be taught to those of a curious and inquiring mind for their everlasting benefit and profit.

STEAM TURBINES FOR DYNAMO DRIVING.

The evolution of the dynamo has passed through a curious cycle of speed changes. When these machines were first introduced their speed was very high; indeed, they were, for the amount of power involved, the fastest running machines of any type in general use. They required to be belted up to the slow-speed engines of that day, and this arrangement involved a considerable waste of energy as well as of space occupied by the belts. With the growth of electric light came a demand for high-speed engines and a continual effort to reduce the normal rate of revolution of the dynamo until, at last, it was possible to build direct-coupled units running at moderate velocities. So great was this betterment of dynamos, that to-day they are made to run at very slow speeds and are adapted to connection with engines running no faster than those of two decades ago. But with these slow-running engines the variations in speed in various parts of the stroke are a serious disadvantage, especially when the dynamo is of the alternating variety and is one of several running in parallel. The addition of heavy flywheels is a complication and a not very effectual cure for the trouble. Of late, however, a new variety of steam motor, the turbine, has come into the field, and principally through the ingenious and diligent labors of one man, the Hon. C. A. Parsons, in England, has been very highly perfected, so that it runs at comparatively moderate speeds and with remarkable efficiency. For direct connection to dynamos this machine possesses points of advantage that make it a class to itself, but, so far, its rate of running is still so high as to require a special construction in the generator to which it is coupled. Throughout a complete revolution its speed varies absolutely none, and for operation of alternating-current machinery it is practically an ideal motor. Strangely enough, though, this newest development in steam engineering, if it meets with the general introduction that its merits seem to imply, will reverse the direction of the labors of dynamo builders and send them to the study of machines adapted for high rotational speeds. In itself this will be a distinct advantage, because of the far greater output of the high-speed machine when space, weight and cost are considered.

The modern forty-foot trolley car full of people weighs a good many tons. To start it with any reasonable degree of swiftness requires the expenditure, for a few seconds, of about one hundred horse-power. Naturally, to stop it with the same degree of celerity will require the same power. To start it, powerful motors and heavy gearing are employed; to stop it, a brass handle about eighteen inches long with a more or less able-bodied man at the end of it is used. The consequence of this arrangement is that the newspapers keep standing in type head-lines like this: "Another Trolley Horror," "The Deadly Juggernaut," etc. Is there not a lesson to be learned from these well-known facts? It is not as if there were no power brakes to be had, for there are several varieties, all good and all tested by experience.

Two years ago the trade in cheap dynamos, motors and other electrical apparatus was large, and the market for such goods was greater than for the high-priced and naturally better built machinery. The conditions to-day are just the reverse—there is practically no demand for cheap electrical goods, but a very large demand for the very best that can be built. This may be a symptom of prosperity, but it also looks like an appreciation of good sense in engineering. Whatever it is, it is an undoubted feature of the present state of the electrical industry in America.

Lightning—The "Dark" Flash.

[*From London Engineering.*]

For some years past notes and letters have appeared in several of our science reviews about what has been called "dark" flashes of lightning, or simply "dark" lightning. To say the least about this supposed meteorological phenomenon, it is as difficult to conceive the physical constitution of such a flash as the special conditions necessary for its production.

The various phenomena of an electric storm are susceptible of explanation in general terms by considering the two charged bodies—say, a pair of clouds, or a cloud and the underlying surface of the earth—as the two coatings of a large condenser, the intervening mass of air constituting the dielectric. As in the analogous case of a Leyden jar, when the strain produced in the glass by the opposite charges becomes sufficiently great, the jar is perforated, so when the strain to which the air is subjected exceeds its "dielectric strength," it suddenly gives way along a line of minimum resistance. The displacement of electricity constituting the discharge gives rise to violent surgings forward and backward along the line of rupture, which surgings continue until the potential difference that caused them has been wiped out. This is effected in an exceedingly small fraction of a second.

The energy of this oscillatory discharge is communicated to the surrounding air, which becomes heated accordingly. We are made aware of this only when the released energy is sufficient to heat the air up to luminescence. It then affects our sense of sight, producing on the retina an effect depending on the form and intensity of the flash.

So far, then, as the eye is concerned, every flash of which it is cognizant is necessarily accompanied by some degree of luminosity. But, on the other hand, we have the testimony of persons whose veracity is as unimpeachable as their accuracy of observation is beyond dispute, that they several times saw in the sky tracks of discharges which were unmistakably dark. Such observations naturally demanded some consideration; the possibility of dark flashes was, therefore, entertained for a while, and theories put forward to explain their occurrence.

It was not long, however, before the astronomical idea of a "personal equation" suggested a retinal effect as a possible explanation. To many it appeared to be not only a possible, but a plausible, explanation; and, indeed, the only one.

So, too, thought Lord Kelvin, when, one evening last August, at Aix-les-Bains, he was favored with a vivid display of lightning. The opportunity was too good to be neglected, and he forthwith proceeded to put the retinal theory to a test. Looking out at the sky, a discharge occurred which gave rise to two well-marked flashes. He saw these distinctly as brilliant zigzags of light, but, on turning, a few seconds later, to a part of the sky which was illuminated by another discharge, he saw, just as he expected, the former double flash dark on a luminous background.

To confirm this observation he returned to the brilliantly lighted drawing room, where, on suddenly looking at one of the walls, he noticed precisely the same reversal. There was the dark double flash complete in every detail. This conclusively shows that the so-called "dark" flash is not a real physical occurrence, but merely a subjective effect. The part of the retina affected by a first flash is in a state of comparative fatigue, so that, when a second one occurs, it fails to respond as actively to the stimulus caused by the general illumination as do the surrounding nerve filaments, thereby giving the observer the impression of a well-defined dark flash.

However strong the evidence afforded by such observations, it was still urged by some that the case against dark lightning was not conclusively made out. They held that the matter could not be considered as finally settled until a satisfactory interpretation was given of the dark flashes noticed occasionally on photographs of lightning.

The photographic plate is, indeed, far more sensitive to the ether ripples that constitute light than is the network of filaments which form the retina. It is, moreover, neither nervous nor impatient, nor are its impressions inaccurate or evanescent; it is ever ready to give a faithful record as well of the invisible trail of a flying meteor as of faint specks in the star depths, whose very existence the largest telescopes fail to detect.

It was thought, then, that such a highly sentient recipient of radiant energy might possibly afford some information in favor of the objective reality of the dark flash.

This view was, however, finally negatived* by the researches of Mr. Clayden, who, knowing that the bright parts of a photograph could be reversed by exposing the plate before development to the action of diffused light, showed that the darkening of the flash was purely a chemical effect in the film, and that it could be reproduced at will. If the lens of a camera be covered, the moment after a flash has occurred, the developed image will always come out bright, feebly or strongly, according to circumstances. Mr. Clayden found, however, that if the plate be exposed after a flash has acted upon it, either to the continued action of a feebly diffused light, or to the powerful glare arising from one or more subsequent flashes, then on development the image of the original flash will probably come out black. This effect can be obtained not only with a lightning flash, but also with a spark from a Wimshurst machine or an induction coil. "It is merely necessary," writes Mr. Clayden, "that the plate should be exposed to the action of a certain amount of light after it has received the impression and before development."

This interesting subject has been examined anew, quite recently, by Dr. William Lockyer. In studying photographs of lightning, especially some taken by himself during the past seven years, he noticed two varieties of the "dark" flash which he failed to detect in any photographs of laboratory lightning at his disposal. These were flashes which he describes as dark with bright cores, and others, which are bright but with decidedly dark borders. For the full acceptance of Mr. Clayden's explanation it appeared, therefore, necessary to produce these two types artificially, and it is precisely in this reproduction that Dr. Lockyer has been successful.

We now know the exact meaning of the black zigzags and their lateral ramifications which may be found in photographs of lightning, and we know also how the dazzling flash of our skies may be made to yield a dark retinal impression. The mystery has at last been cleared up. The term "dark" lightning is, therefore, a misnomer, corresponding to nothing real in Nature, and as such it deserves to be dismissed for ever from our scientific nomenclature.

We find a few other terms in our literature which so richly deserve a similar fate that it is a wonder they were not long ago relegated to the profoundest depths of the limbo of oblivion—*e. g.*, thundertube, thunderbolt, thunderstorm.

Thunder is in no way concerned in the formation of the peculiar conical cavities sometimes formed in sandy soil by an electric discharge, and which early writers unwittingly called thundertubes.

Again, there is no such thing as a thunderbolt distinct from the lightning flash pure and simple. "A bolt from the blue," in the popular mind, means, we readily admit, an intensely hot solid mass which comes down in the wake of the flash. Now, every one knows that meteoric masses visit us at all hours of the day and in all seasons of the year, as well before as during and after a storm. If, perchance, a mass rendered red-hot or white-hot by its rapid passage through a hundred miles or so of our gaseous envelope should chance to follow in the rarefied wake of a flash and crash down upon the earth, it is none the less a lump of matter of cosmic, and not atmospheric, origin. It is not a fireball of electrical formation, but simply a glowing mass of brute matter similar to the stuff of which this and other worlds are made.

Shakespeare, in "Cymbeline," Act IV, Scene II, makes Guiderius bid his friend

> "Fear no more the lightning-flash,"

to which Arviragus promptly adds,

> "Nor the all-dreaded thunder-stone."

Here the dramatist simply adopts the popular notion of his time. With all his intuition, he could no more have anticipated the meteoroidal views of the German, Chladni and Hubert A. Newton, of Yale, than the protective system against lightning recommended by Maxwell and developed by Lodge.

Even the term thunderstorm is objectionable, inasmuch as the crash or the peal, or the rolling noise that usually accompanies the electric discharge, is by far the less important characteristic of the phenomenon. Who speaks of a shower as a "patter" storm? Who would venture to describe a hailstorm in one of our daily papers under the title of a "rattle" storm? Is it not equally belittling and improper to speak of an impressive electric display as a "thunder"-storm?

We commend these curiosities of our scientific literature, together with such strange improvisations or importations as "black electric sparks," "X-light," "Becquerel light" and "dark light" (la lumière noire of Le Bon)† to the careful consideration of our leading writers on physical science. A reform is obviously needed. They alone can carry it out.

*Proceedings of the Physical Society, Vol. x.

†Le Bon writes: "Nous nous trouvons en présence d'un mode d'energie qui n'est plus de la lumière puisqu'il n'a plus qu'une partie de ses propriétés et n'obéit pas aux lois de sa propagation" (*Comptes Rendus*); why then call it *lumière* at all?

ELECTRIC RAILWAY NOTES.

The Massachusetts Railroad Commission has given official approval of the plans for location of tracks and method of construction submitted by the Boston Elevated Street Railway.

The Tiffin, (Ohio) Fostoria & Eastern Railway Company has announced an advance in passenger rates, after December 1, 1899. The new rates will be 50 per cent higher than those now in force.

Mr. Robert Hewins, the retiring superintendent of the Norton & Taunton (Mass.) Street Railway Company, was this week presented with a gold watch as a token of the esteem in which he has been held by the employés.

A syndicate is at present building an electric street railroad in Dawson City, and a line is to be built across the river to Klondike City if the necessary aid is obtained from the Canadian parliament. The line is to be extended up the Bonanza River to Fort Bonanza and Eldorado.

At a fire at the car house of the Quincy & Boston (Mass.) Street Railway a few days ago seventeen of the twenty cars of the company were burned. Traffic is not interferred with, as neighboring roads are supplying the company with cars. Loss is placed at $55,000, covered by insurance.

Consul Milner, of Calais, France, informs the State Department that a company organized at Paris is arranging to establish an electric railway in Calais. The equipment has not yet been purchased, and the Consul thinks that United States manufacturers may wish to bid. The old tram cars now in use are of American make.

Mr. James O. Callender, of Sydney, Australia, consulting engineer for the Adelaide Development Company, of London, England, has completed a contract with the Westinghouse Electric and Manufacturing Company for a generating plant and entire equipment for the Adelaide traction system. The contract will run between $500,000 and $750,000.

A preliminary injunction was granted by Judge Ehrgood several days ago, restraining the Lebanon (Pa.) Valley Street Railway Company from operating their road between Annville and Palmyra. The plaintiffs, the American Telegraph and Telephone Company, claim the railway company, in placing its overhead feed wire, in two instances, used their poles without permission, and that the telephone service will suffer by the proximity of the trolley wires to those of the plaintiff company.

The Moundsville & Benwood electric street car line, eight miles long, beginning at the terminus of the Wheeling street car line in Benwood, Ohio, and running to Moundsville, W. Va., has been sold to the latter company. The price was put at $175,000, or about 70 per cent of the capitalized stock, which was $250,000. The Wheeling Street Car Company some time ago bought up the Bellaire, Bridgeport & Martin's Ferry line, and now owns outright all the electric street car lines in this section of the Ohio valley.

The Appellate Division of the Supreme Court has affirmed the judgment of the County Court in a suit brought to recover damages from the Nassau Electric Railroad Company, of Brooklyn, N. Y., for using soft coal in violation of the laws of 1895, which prohibits its use within city limits. Justice Goodrich holds that it is well within the police power of the state for the Legislature to declare that the burning of soft coal within certain prescribed limits of the city is detrimental to the public welfare and should be prohibited.

The Milford, Attleboro & Woonsocket (Mass.) Street Railway Company, by its president, J. G. Ray, and its treasurer, E. K. Ray, has filed with the secretary of the Commonwealth, a certificate that its stock, $200,000, is subscribed, and that fifty per cent is paid in. The Templeton Street Railway, by its president, Frederick Greenwood, and its treasurer, C. E. Ingalls, has filed a certificate of the full payment of its capital, $50,000. The Easton Street Railway Company, Franklin Worcester, president, E. F. Draper, treasurer, certifies to the full payment of capital, $40,000.

A syndicate of capitalists in Ohio, offer to take all the street railway franchises in Columbus and make a three-cent fare, the municipality to have the privilege of keeping the rate of fare at five cents, and the extra two cents to go into the city treasury. By the latter arrangement, out of every million dollars of gross receipts, the city would get $400,000, as the company would pay all the expenses out of its share of the fares. As the present street railway fare is five cents, this arrangement would give to the municipality a considerable income and allow for a large reduction in the tax rate.

New York City Street Railway Elections.

At the annual meeting of the stockholders of the Metropolitan Street Railway Company, New York, held December 3, nine directors were elected, as follows: H. H. Vreeland, W. L. Elkins, Thomas Dolan, Charles E. Warren, P. A. B. Widener, Thomas F. Ryan, D. B. Hasbrouck, H. A. Robinson and Harry P. Whitney. R. L. Anderton, Jr., D. C. Moorehead and John T. Little, Jr., were appointed inspectors of election.

The directors elected by the Twenty-eighth and Twenty-ninth street Crosstown Railroad Company's stockholders at their annual meeting were H. H. Vreeland, D. B. Hasbrouck, P. A. B. Widener, W. L. Elkins, Thomas Dolan, Thomas F. Ryan, C. E. Warren, H. S. Beattie and Henry A. Robinson. The inspectors of election chosen were the same as those of the Metropolitan Company.

How Not to Get Foreign Trade.

If to our door should come a peddler selling goods, but without either goods or samples, and, in a language unknown to us, he should describe what he wished to sell and give the lengths, or weights and prices, still in the same language, should we be likely to buy? And then, if we, in a language of which he was ignorant, should tell him what we did want and what we were willing to pay, would it be surprising if we received "Clarke's Commentaries" in three volumes, or a duplex, double-back action door mat and electric bell combined? All this seems absurd, but when one of our Consuls urges upon the State Department that if our manufacturers wish to succeed in the Italian market, the lists of goods should be in the Italian language, that the Italian weights and measures should be used, and the traveling salesmen should speak the language of the desired customer, does he not present exactly the same situation?—*Philadelphia Ledger.*

News From the Seat of War.

The London *Globe* bursts into rhyme in a recent issue as follows:

Alas! 'tis in vain that we scan
The sheets of the "Latest Edition";
For news of a man in the rear or the van
Is always delayed in transmission.

Oh! how can the man in the street
Discover the present position,
Of the fighting *élite* in the army and fleet
When the news is delayed in transmission?

Some eventide posters will show
That the Boers have been sent to perdition.
Was it yesterday? No. It occurred at Glencoe,
And was somehow delayed in transmission.

So, postal authorities, use,
If it's possible, more expedition.
We give you your dues, but news is not news,
When it's always delayed in transmission.

Tramways in Manchester, Eng.

Manchester is seeking to borrow £800,000 for tramway purposes, the scheme comprising the reconstruction of the whole of the present track within the city boundary; the electrical equipment of the whole of the track in the city and the outside districts that the Corporation had already come to an agreement with; the provision of 600 cars, and the estimate of construction of one car-shed to accommodate 252 cars, and also the preliminary expenses chargeable to capital. At the inquiry, Mr. C. H. Wordingham, city electrical engineer, said that the overhead trolley system was that which, in his opinion, was best suited to the exigencies of Manchester traffic, with a single trolley wire and using the rails as a return. As to the various systems of construction which were available, he regarded the span-wire construction, with the centre-running trolley, as the best mechanically, while what was called the Aigburth system, with side running trolley, was the best in appearance. They might use in some streets one system and in other streets the second. The poles would be of the same strength in all cases, so that in case of need there would be no trouble in passing at slight expense from one system to the other. He assumed that the Aigburth system of construction would be used throughout, and therefore the cost of equipment of double track would be exactly double that of a single track. This latter, he estimated, would approximate £1,300 a mile. That meant for an overhead equipment of sixty-eight miles in the city an estimate of £88,400, with £22,100 for the outside districts. To this he added £16,575 for contingencies. For bonding the rails and further contingencies therewith he put down £22,925, this giving them a total of £150,000. In regard to the stations and substations, it was the proposal of the committee that no point of the track should be more than half a mile away from the source of supply.—*Industries and Iron.*

A syndicate, headed by Tom L. and Albert Johnson, the street-car magnates, will build a street railroad in Honolulu and on Oahu Island, on which the capital of the Hawaiian Islands is situated. Electric lines will not only be built within the city limits, but suburban lines will be constructed leading to the different points of interest and business near the city.

Roentgen Rays and the War in South Africa.

In an article in the *British Medical Journal* Mr. J. Hall Edwards, surgical radiographer to the General Hospital, Birmingham, criticises the action of the War Office regarding the use of Roentgen rays in South Africa. He states that the Roentgen-ray apparatus, as an adjunct to military surgery, is not receiving the attention which its importance warrants. Of the 10 sets of apparatus provided only four have reached South Africa, and two of these too far away from the field of operations to be of much service. The remaining six sets, it is stated by a British contemporary, are either on their way out or about to be dispatched. With the rays at command an injured limb can be examined, the injury diagnosed, and the amount of injury discovered without giving the patient pain and without removing the dressings. The probe is rendered unnecessary, and dangerous manipulation can be dispensed with. Experiments, he says, show that a complete apparatus, with developing tent and plates and chemicals, can be carried to the field in an ambulance wagon, and will work to perfection after being freely jolted for six miles. The full force of these statements is brought out by the statement of Reuter's correspondent at Pietermaritzburg, who says that the Natal Government's Roentgen-ray apparatus is doing splendid work among the wounded there in locating the position of the bullets, which it was impossible to find with less powerful apparatus.

Football and Industry.

One of our English contemporaries thus makes its plaintive moan: "Those outside the Midland counties have little idea of the harassing influence of football on industrial life. Men leave their work for half days at a time in order to see contests between picked teams, and in some places make united representations to their employers for holidays for practically all the workers in the factory. An instance of how far these requests are sometimes carried may be seen at Birmingham, where, at a meeting of the Wellington St. George's Football Club, it was resolved that representations be made to the miners and employers, with the object of prevailing upon miners to work half an hour longer on two days of the week, and thus be able to attend the matches on a Saturday. It appears that this particular football team has had a rather uncertain time, financially, of late, and in order to revive its fortunes the arrangements of local employers are to be entirely reorganized, so that football may prosper in the land. If the employers made the request for less attention to be given to professional pastimes in the interest of British industry, we wonder what kind of a reception it would have."

Electric Lighting Transformers.

Probably no accessory of electric lighting circuits has received more careful study and been the subject of more costly experiments than the proper design and structure of transformers. As is well-known, the two elements of loss in a transformer are

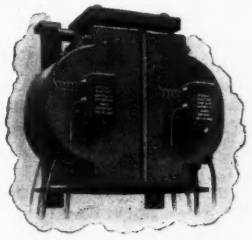


FIG. 1.—ELECTRIC LIGHTING TRANSFORMERS.

the resistance of its windings and the loss in constantly reversing the magentization of its core, called core-loss, while with the latter is closely connected the regulation of the instrument. To attain the highest practical availability the transformer should have low core and winding loss and at the same time the highest regulation possible. In the endeavor to reach the happy medium of balance between these requirements the Stanley Electric Manufacturing Company, of Pittsfield, Mass., has perfected a type of electric lighting transformer which is illustrated here. Fig. 1 shows the external appearance of the apparatus ready to be hung up, and Fig. 2 shows the detachable safety fuse arrangements whereby the fuses are removed entirely from the primary circuit when necessary to change them. For potentials up to and including 2,000 volts, the use of oil in the instruments is not recommended, as a well designed transformer should be able to withstand such pressures efficiently without oil. All of them are made with interchangeable primaries, permitting attachment to circuits of 1,000 or 2,000 volts, and many sizes have also split secondaries, giving 50 volts on each side of a natural wire and thus useful either on a three-phase system or on a 50 or 100-volt distribution. The Western Electric Company, of Chicago, keeps on hand constantly large numbers of these transformers in no less than fourteen sizes, ranging from 10 to 600 lights capacity.

AUTOMOBILE NOTES.

A gold cup for international competition has been offered by the Automobile Club, of France. The first test will be held as near May 1 as possible, the idea being to make the date coincide with the great automobile day at the Exposition. The rules which will govern this cup have not been made as yet, and it is expected to arrange racing conditions which will be satisfactory to automobilists of all countries.

Since the introduction of the automobile, lightness has had to be considered to such an extent that only light loads could be taken care of. The firm of Carl H. Schultz, New York, has just put into service the

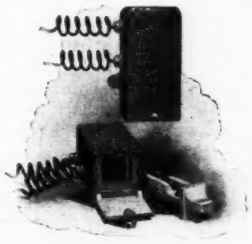


FIG. 2.—ELECTRIC LIGHTING TRANSFORMERS.

heaviest electromobile ever built. Work on this wagon was started almost a year ago, but the difficulties to be overcome were so numerous that only a few days ago the first wagon could be delivered. Inclusive of batteries the wagon weighs 5,600 pounds, which, added to the weight of the usual load, brings the total weight up to 7,040 pounds, making it the heaviest electromobile delivery wagon in the world.

The use of the automobile in Buenos Ayres is rapidly increasing, and vehicles of the electric and petroleum types are now frequently met with in the streets of that city. These include not only private carriages and tricycles, but also heavy delivery wagons for the use of large stores. The fact that facilities for making repairs are lacking has been hitherto a drawback in the use of these vehicles, but as a result of their adoption there is no doubt that these facilities will soon be provided, and besides, the condition of the roads is beginning to improve. A further step in advance has been the formation of the Argentine Touring Club, says the *Scientific American*, which has been founded, not long since, by a number of influential amateurs and commercial men. The new society will devote itself to the question of automobile interests, and one of the first steps taken has been that of the establishment, in all the provinces of the Argentine Republic, of roads which are specially reserved for bicycles and light automobiles. These roads have already commenced to radiate from Buenos Ayres to a distance of 60 to 70 miles, and it is intended to continue the work until a good system of roads is established throughout the country.

A New Electrolytic Alkali Process.

A demonstration of the Hargreaves–Bird electrolytic alkali process was given recently at the temporary works of the General Electrolytic Patent Company, Limited, at Farnworth, near Widnes, England. The electrolytic cell employed is extremely simple. The two side walls, ten feet by five feet each, are formed by the combined diaphragms and cathodes. In the narrow space between these side walls the carbon anodes are placed. The anode and cathode surfaces are thus brought close together in operation. The sodium product is brought by the action of the electric current to the exposed surface of the cathodes, where, meeting an atmosphere of carbonic acid and moist steam, it is immediately dissolved and removed. Consequently, flowing from the hundred square feet of cathode surface, there is a continuous stream of a strong solution of carbonate of soda, while the chlorine rising from the anodes is led off undiluted for use in the manufacture of bleaching powder or chlorates. Thus soda and chlorine are produced by the direct decomposition of common salt without the introduction of any other ingredient, and without the production of any waste material. Extensive works are to be established at Middlewitch, Cheshire, where a large estate has been purchased, which has underneath a valuable bed of salt. There is a coal field in close proximity. In the works 250 cells will be erected, each one of which will be capable of producing per annum 37 tons of soda ash and 68 tons of bleaching powder, containing 37 per cent of available chlorine, a total output of over 9,000 tons of ash and over 16,000 tons of bleach per annum.

Commercial Cable Company.

The Commercial Cable Company, on December 5, filed at Albany, N. Y., a certificate of an increase of its capital stock from $10,000,000 to $15,000,000. The certificate states that the entire original capital is paid in, and that the company's debts and liabilities are $18,324,349.

THE HIGHEST AIM OF THE PHYSICIST.*

BY PROF. HENRY A. ROWLAND.

Gentlemen and Fellow Physicists of America: We meet to-day on an occasion which marks an epoch in the history of physics in America; may the future show that it also marks an epoch in the history of the science which this society is organized to cultivate! For we meet here in the interest of a science which above all sciences deals with the foundation of the universe, with the constitution of matter from which everything in the universe is made and with the ether of space by which alone the various portions of matter forming the universe affect each other even at such distances as we may never expect to traverse, whatever the progress of our science in the future.

We, who have devoted our lives to the solution of problems connected with physics, now meet together to help each other and to forward the interests of the subject which we love. A subject which appeals most strongly to the better instincts of our nature and the problems of which tax our minds to the limit of their capacity and suggest the grandest and noblest ideas of which they are capable.

In a country where the doctrine of the equal rights of man has been distorted to mean the equality of man in other respects, we form a small and unique body of men, a new variety of the human race, as one of our greatest scientists calls it, whose views of what constitutes the greatest achievement in life are very different from those around us. In this respect we form an aristocracy, not of wealth, not of pedigree, but of intellect and of ideals, holding him in the highest respect who adds the most to our knowledge, or who strives after it as the highest good.

Thus we meet together for mutual sympathy and the interchange of knowledge, and may we do so ever with appreciation of the benefits to ourselves and possibly to our science. Above all, let us cultivate the idea of the dignity of our pursuit, so that this feeling may sustain us in the midst of a world which gives its highest praise, not to the investigation in the pure etherial physics which our Society is formed to cultivate, but to one who uses it for satisfying the physical rather than the intellectual needs of mankind. He who makes two blades of grass grow where one grew before is the benefactor of mankind; but he who obscurely worked to find the laws of such growth is the intellectual superior as well as the greater benefactor of the two.

How stands our country, then, in this respect? My answer must still be, now; as it was fifteen years ago, that much of the intellect of the country is still wasted in the pursuit of so-called practical science which ministers to our physical needs, and but little thought and money is given to the grander portion of the subject which appeals to our intellect alone. But your presence here gives evidence that such a condition is not to last forever.

Even in the past we have a few names whom scientists throughout the world delight to honor. Franklin, who almost revolutionized the science of electricity by a few simple, but profound experiments. Count Rumford, whose experiments almost demonstrated the nature of heat. Henry, who might have done much for the progress of physics had he published more fully the results of his investigations. Mayer, whose simple and ingenious experiments have been a source of pleasure and profit to many. This is the meagre list of those whom death allows me to speak of and who have earned mention here by doing something for the progress of our science. And yet the record has been searched for more than a hundred years. How different had I started to record those who have made useful and beneficial inventions!

But I know, when I look in the faces of those before me, where the eager intellect and high purpose sit enthroned on bodies possessing the vigor and strength of youth, that the writer of a hundred years hence can no longer throw such a reproach upon our country. Nor can we blame those who have gone before us. The progress of every science shows us the condition of its growth. Very few persons, if isolated in a semi-civilized land, have either the desire or the opportunity of pursuing the higher branches of science. Even if they should be able to do so, their influence on their science depends upon what they publish and make known to the world. A hermit philosopher we can imagine might make many useful discoveries. Yet, if he keeps them to himself, he can never claim to have benefited the world in any degree. His unpublished results are his private gain, but the world is no better off until he has made them known in language strong enough to call attention to them, and to convince the world of their truth. Thus, to encourage the growth of any science, the best thing we can do, is to meet together in its interest, to discuss its problems, to criticise each other's work, and, best of all, to provide means by which the better portion of it may be made known to the world. Furthermore, let us encourage discrimination in our thoughts and work. Let us recognize the eras when great thoughts have been introduced into our subject, and let us honor the great men who introduced and proved them correct. Let us forever reject such foolish ideas as the equality of mankind, and carefully give the greater credit to the greater man. So, in choosing the subjects for our investigation, let us, if possible, work upon those subjects which will finally give us an advanced knowledge of some great subject. I am aware that we can not always do this; our ideas will often flow in side channels, but, with the great problems of the universe before us, we may some time be able to do our share toward the greater end.

What is matter; what is gravitation; what is ether and the radiation through it; what is electricity and magnetism; how are these connected together and what is their relation to heat? These are the greater problems of the universe. But many infinitely smaller problems we must attack and solve before we can even guess at the solution of the greater ones.

In our attitude toward these greater problems how do we stand and what is the foundation of our knowledge?

Newton and the great array of astronomers who have succeeded him have proved that, within planetary distances, matter attracts all others with a force varying inversely as the square of the distance. But what sort of proof have we of this law? It is derived from astronomical observations on the planetary orbits. It agrees very well within these immense spaces; but where is the evidence that the law holds for smaller distances? We measure the lunar distance and the size of the earth and compare the force at that distance with the force of gravitation on the earth's surface. But to do this we must compare the matter in the earth with that in the sun. This we can only do by assuming the law to be proved. Again, in descending from the earth's gravitation to that of two small bodies, as in the Cavendish experiment, we assume the law to hold and deduce the mass of the earth in terms of our unit of mass. Hence, when we say that the mass of the earth is 5½ times that of an equal volume of water, we assume the law of gravitation to be that of Newton. Thus, a proof of the law from planetary down to terrestrial distances is physically impossible.

Again, that portion of the law which says that gravitational attraction is proportional to the quantity of matter, which is the same as saying that the attraction of one body by another is not affected by the presence of a third, the feeble proof that we give by weighing bodies in a balance in different positions with respect to each other can not be accepted on a larger scale. When we can tear the sun into two portions and prove that either of the two halves attracts half as much as the whole, then we shall have a proof worth mentioning.

Then as to the relation of gravitation and time what can we say? Can we for a moment suppose that two bodies moving through space with great velocities have their gravitation unaltered? I think not. Neither can we accept Laplace's proof that the force of gravitation acts instantaneously through space, for we can readily imagine some compensating features unthought of by Laplace.

How little we know then of this law which has been under observation for 200 years!

Then as to matter itself how have our views changed and how are they constantly changing. The round hard atom of Newton which God alone could break into pieces has become a molecule composed of many atoms, and each of the smaller atoms has become so elastic that after vibrating 100,000 times its amplitude of vibration is scarcely diminished. It has become so complicated that it can vibrate with as many thousand notes. We cover the atom with patches of electricity here and there, and make of it a system compared with which the planetary system, nay, the universe itself, is simplicity. Nay, more: Some of us even claim the power, which Newton attributed to God alone, of breaking the atom into smaller pieces whose size is left to the imagination. Where, then, is that person who ignorantly sneers at the study of matter as a material and gross study? Where, again, is that man with gifts so God-like and mind so elevated that he can attack and solve its problem?

To all matter we attribute two properties, gravitation and inertia. Without these two matter can not exist. The greatest of the natural laws states that the power of gravitational attraction is proportional to the mass of the body. This law of Newton, almost neglected in the thoughts of physicists, undoubtedly has vast import of the very deepest meaning. Shall it mean that all matter is finally constructed of uniform and similar primordial atoms or can we find some other explanation?

That the molecules of matter are not round, we know from the facts of crystallography and the action of matter in rotating the plane of polarization of light.

That portions of the molecule and even of the atoms are electrically charged, we know from electrolysis, the action of gases in a vacuum tube and from the Zeeman effect.

That some of them act like little magnets, we know from the magnetic action of iron, nickel and cobalt.

That they are elastic, the spectrum shows, and that the vibrating portion carries the electrified charge with it is shown by the Zeeman effect.

Here, then, we have made quite a start in our problem; but how far are we from the complete solution? How can we imagine the material of which ordinary or primordial atoms are made, dealing, as we do, only with aggregation of atoms alone? Forever beyond our sight vibrating an almost infinite numbe

* Address delivered to the Physical Society of America by the President, at its meeting in New York, October 28, 1899.

of times in a second, moving hither and yon with restless energy at all temperatures beyond the absolute zero of temperature, it is certainly a wonderful feat of human reason and imagination that we know as much as we do at present. Encouraged by these results, let us not linger too long in their contemplation, but press forward to the new discoveries which await us in the future.

Then, as to electricity, the subtile spirit of the amber, the demon who reached out his gluttonous arms to draw in the light bodies within his reach, the fluid which could run through metals with the greatest ease but could be stopped by a frail piece of glass! Where is it now? Vanished, thrown on the waste heap of our discarded theories to be replaced by a far nobler and exalted one of action in the ether of space.

And so we are brought to consider that other great entity—the ether: filling all space without limit, we imagine the ether to be the only means by which two portions of matter distant from each other can have any mutual action. By its means we imagine every atom in the universe to be bound to every other atom by the force of gravitation and often by the force of magnetic and electric action, and we conceive that it alone conveys the vibratory motion of each atom or molecule out into space to be ever lost in endless radiation, passing out into infinite space or absorbed by some other atoms which happen to be in its path. By it all electromagnetic energy is conveyed from the feeble attraction of the rubbed amber through the many thousand horse-power conveyed by the electric wires from Niagara to the mighty rush of energy always flowing from the sun in a flood of radiation. Actions feeble and actions mighty from intermolecular distances through interplanetary and interstellar distances until we reach the mighty distances which bound the universe—all have their being in this wondrous ether.

And yet, however wonderful it may be, its laws are far more simple than those of matter. Every wave in it, whatever its length or intensity, proceeds onward in it, according to well-known laws, all with the same speed, unaltered in direction from its source by electrified matter, to the confines of the universe unimpaired in energy, unless it is disturbed by the presence of matter. However, the waves may cross each other, each proceeds by itself without interference with the others.

So with regard to gravitation, we have no evidence that the presence of a third body affects the mutual attraction of two other bodies, or that the presence of a third quantity of electricity affects the mutual attraction of two other quantities. The same for magnetism.

For this reason the laws of gravitation and of electric and magnetic action including radiation are the simplest of all laws when we confine them to a so-called vacuum, but become more and more complicated when we treat them in space containing matter.

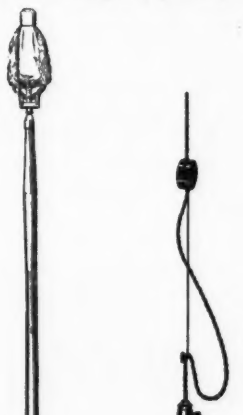
Subject the ether to immense electrostatic, magnetic or gravitational forces, and we find absolutely no signs of its breaking down or even of change of properties. Set it into vibration by means of an intensely hot body like the sun and it conveys many thousand horse-power for each square foot of surface as quietly and with apparently unchanged laws as if it were conveying the energy of a tallow dip.

Again, subject a millimetre of ether to the stress of many thousand, nay even a million, volts and yet we see no signs of breaking down.

(To be continued.)

Incandescent Lamp Accessories.

The illustrations shown herewith represent two convenient accessories for an incandescent lighting system which have proved their usefulness in many installations. Fig. 1 shows an appliance for cleaning the bulbs of incandescent lamps, especially those



FIGS. 1 AND 2.—INCANDESCENT LAMP ACCESSORIES.

which are mounted in inaccessible situations. The fingers of this machine are covered with soft felt material, and are arranged on springs, so that when it is thrust against the bottom of the bulb and turned it effectually wipes off the dust from the surface. It is said to be very rapid and convenient in operation.

Fig. 2 represents an incandescent lamp cord adjuster. This little instrument, which is only two inches in diameter, works on the well-known spring principle of the Hartshorn roller-shade, and enables the height of the lamp to be adjusted instantly within the limits of the length of the cord—about four feet. These appliances, as well as a variety of manipulators for incandescent lamps, are manufactured by the Incandescent Electric Light Manipulator Company, of Boston, Mass.

Reestablishing Telegraphic Communication.

Dr. Oliver Lodge, in a recent issue of the London *Times*, writes as follows:

"It is rash unasked to offer suggestions to practical telegraphists, such as no doubt exist inside and in the vicinity of Ladysmith, but perhaps it might be worth while by cable to request them to try to communicate by the following method: Lay a wire across Ladysmith, or other invested station, east and west, and earth the two ends thoroughly, so as to get as long a base as possible. Insert in this wire a powerful battery, or a dynamo, and a signaling key (sharper signals can be got by breaking the current under alcohol or between the poles of a strong magnet); insert also, by an alternative switch, a pair of low resistance telephones, and a condenser to keep out steady earth currents. Then let another party, south of the above district and as near as is consistent with military exigencies, lay or utilize another east and west wire, of greater length than the other, and likewise thoroughly well earthed at each end in damp soil, employing salt if necessary, or, still better, utilizing a river; and let them likewise insert a pair of telephones (with a condenser) to receive signals, and a dynamo or battery with a signaling key to send them. It matters little where the outside actual station is, but its two 'earths' should be as near and as much one on each side of the invested station as is practicable. Unless the soil is hopelessly dry for all accessible depths, slow signaling by this method of earth-tapping can certainly be achieved, provided strong enough currents are used, even without the use of special apparatus, the short and the long signals of the Morse code being marked by the beginning and end of the current, or by the interval between two successive reversals, and being readable by an operator skilled in the use of the 'sounder.' Earth-current disturbances will be heard, but can usually be recognized and disregarded. An alternating dynamo would be preferable to a continuous-current dynamo if it were of high frequency, and sometimes the harmonics of an ordinary alternator are sufficiently strong for the purpose; or a revolving commutator, can be made to carve an ordinary battery current into rapid intermittencies, producing a hum in the distant telephone, as in the arrangement applied under the direction of Sir W. Preece in the sea near Cardiff. A great number of refinements could be applied if there were plenty of time, but my object is to point out that a slow kind of telegraphy can almost certainly be reestablished, if it be considered worth while, with apparatus probably already on the spot. (The possible use of the line of rails as a semi-connector, or earth substitute, should not be overlooked.) To avoid difficulties about 'calling,' or asking for a change from 'send' to 'receive,' it is natural to suggest that each station should 'receive' for every alternate hour, and then the skilled operator rests. The 'sending' demands much less skill than the 'receiving.' A telephone held to the sender's ear, and connected, if necessary, to a couple of iron pegs in the earth in his immediate vicinity, or to a yard of wire running parallel to his line wire, will tell him if he is sending signals in an intelligible manner or not."

Village Lighting in Spain.

An interesting development of electric transmission is shortly to be inaugurated at Santander, in Spain, says the London *Electrical Engineer*. It seems that at this time Mr. D. G. Illera has laid down a large electric installation to supply his workshops and factories with motive power. The various looms in these factories are to be electrically driven. He proposes now to put down, in conjunction with this distribution of power scheme, mains to a number of small towns and villages in the vicinity of the town. For this purpose additional dynamos and turbines are being laid down. It is also estimated that the load provided for the factory will not be required to be utilized in the evening so that a considerable economy in the first cost of machinery will be effected. It is expected that the new machinery will soon be installed, so that the light can be supplied to these different villages at the beginning of next year. The three towns of Grado, Gandamo and Pavia are also shortly to be supplied with electric light, and in this case the necessary works for the three towns will be situated on a river near them, and the power transmitted by means of cables. The conjoint action in this case is expected to effect considerable saving.

A Prejudiced Opinion.

[*From The Telegraph Age.*]

A great many people who laughed at telegraphy when it first came, and guffawed at telephones, would like awfully well to call wireless telegraphy the fraud that it is, and are afraid to.

Australian Copper.

Copper occupies a leading place among Australian mineral products, being found in each of the colonies, the richest deposits being situated in South Australia, New South Wales coming next; the value of the copper raised in the former colony, up to the end of 1897, being £21,280,889, and in the latter £4,351,343, the total production of the colonies, including New Zealand, during the same period being £28,536,981. Copper mining in New South Wales dates from between 1844 and 1845, when gold mining was yet a thing of the future, but the progress of the industry was somewhat desultory until 1877, when the annual exports were valued at £127,396. Thenceforth they rapidly increased until 1881, when the estimated value was £257,884. In the following year there was a heavy decline, but in 1883 the figures stood at £472,982. During the succeeding years there were numerous fluctuations, occasioned by the depressed condition of the copper market generally, and in 1894 the figures sank to £63,617; but since then there has been a steady recovery, the value in 1897 being £283,174, and in 1898 £257,143. Next to gold and silver, copper is at present the most valuable of the metallic minerals found in New South Wales, although the value of the tin raised to the end of 1898 is considerably greater, being £6,292,056, against copper £4,624,029.

The principal copper deposits are found in the central part of the colony, between the Macquarie, Bogan and Darling rivers. Deposits have also been found in the New England and southern districts, as well as at Broken Hill, showing that the mineral is widely distributed throughout the colony. The principal difficulty with which the industry, in common with other branches of mining industry, has had to contend in the past consisted in the great distance of some of the leading copper mines from the nearest port of shipment, together with deficient means, and, consequently, heavy cost of land carriage. These drawbacks are now being rectified. The copper lodes of New South Wales contain ores of a very much higher percentage than those of many well-known mines worked at a profit in other parts of the world, and, with a fair price, should return satisfactory results. Mines which could not be profitably worked a few years ago have been reopened, and a considerable amount of capital has been expended in the erection of new machinery. The more important mines are those of Cobar, 550 miles west of Sydney, where the Great Cobar mine, which recommenced work early in 1894, raised in the following year 37,845 tons of ore, yielding 1,703 tons of smelted copper; in 1896, 66,431 tons of ore, yielding 2,650 tons of smelted copper, valued at £107,200; and, in 1897, 64,820 tons of ore, yielding 2,462 tons of smelted copper, valued at £108,306. It may be mentioned that the copper extracted from this mine is found to contain gold more than sufficient to pay for mining and treating the ore.

The syndicate to whom the mines belong now give employment to 450 men. In 1897 the Nymagee Copper Mines, 441 miles from Sydney, and which has been acquired by the Great Cobar Syndicate, smelted 16,863 tons of ore, yielding 543 tons of refined copper, valued at £24,435. The Burraga Company produced 8,907 tons of ore, yielding 727 tons of refined copper, valued at £34,896; 150 men find constant employment at their mines. The production of the Mount Hope Copper Company was 734 tons of ore, yielding 110 tons of refined copper, valued at £5,340; while at South Mount Hope another company raised 1,200 tons of ore, the refined copper obtained amounting to 110 tons, valued at £4,500. The Girilambone Copper Mining Company employ about 200 men, and have a very complete plant. During the year 17,154 tons of ore were raised, the copper contents being 733 tons. Refining has been commenced by this company, 173 tons of almost pure copper having been so far produced. In other districts considerable activity is also being displayed. It may be mentioned that the Broken Hill Proprietary Company saved copper to the value of £56,880 in the course of their operations during the year.

The total number of men engaged in copper mining in 1898 was 1,976. In 1896 it was only 810, a fact showing the rapid revival of the industry. Most of the copper mines are situated in rich agricultural districts, and mixed farming is extensively carried on. It may also be mentioned that the New South Wales Department of Mines has published, at a low price, a copiously illustrated work on the copper mining industry of the colony, containing a mass of practical information concerning the same.—*The Practical Engineer.*

LITERARY.

The translation of the article by Professor Righi on "Volta and the Voltaic Cell," which appeared in the ELECTRICAL REVIEW of November 22 and 29, is due to our esteemed British contemporary, the *Electrical Engineer.*

ELECTRIC LIGHT FLASHES.

The Board of Village Trustees, of Waterville, N. Y., at a recent special meeting, passed a resolution granting a franchise to an electric light company to establish a plant in the village for the purpose of lighting the streets and furnishing power for commercial and manufacturing purposes.

The plant of the Evanston (Ill.) Electric Illuminating Company was damaged by fire a few days ago. The building was only slightly damaged, but on the third floor the fire worked havoc in the stock room and meter-testing department. The loss may reach $20,000, protected by full insurance.

The City Council, of Wellington, Kas., has voted to submit on December 30 a proposition to the voters to issue $64,000 in bonds, $50,000 of this amount to be used in the purchase of the waterworks system, and the remaining $14,000 for the construction and equipment of an electric lighting plant.

It is stated that a deal has been consummated whereby the Edison electric light plant, the only illuminating company in Altoona, Pa., has been sold by the Electric Company of America, at New York, to a Philadelphia electric combine. Over $1,000,000 changed hands in the transaction. The new purchasers have also secured control of the trolley lines and gas plant of Altoona, and it is reported that their interests will be consolidated and in the future placed under the direction of one management.

Notwithstanding threatening weather 10,000 people gathered upon the streets of Flint, Mich., a few nights since to witness the dedication of the new electric light works. At 8 o'clock the lights were turned on amid the playing of a brass band and the screeching of thousands of horns in the hands of small boys. The pyrotechnical display was something magnificent and outdid any effort made in this line heretofore even by the political parties, the street being a blaze of fire the whole length of it. The arches, eight in number, were erected and paid for by popular subscription. Each arch was formally dedicated to the use of Flint City. The oration of the occasion was made by City Attorney Edward S. Lee. Flint is the first city in Michigan to adopt this mode of street lighting.

The authorities of Buenos Ayres, Argentina, are considering a scheme for lighting the outskirts of that city with arc lamps, and supplying a system of electric power for industrial purposes in general in the city and neighborhood. It is estimated that an expenditure of $2,000,000 will have to be made. Forty thousand feet of feeder cable and 600,000 feet of distributing cable will be required. There is said to be at present invested in the Argentine Republic about $75,000,000 of British capital in various electrical undertakings. In these undertakings some $48,000,000 has been spent for material and equipment. Out of this sum American manufacturers have furnished more than $30,000,000. Mr. W. J. Clark, of the General Electric Company, is now on his way from Buenos Ayres to London, and he is expected in the United States about the middle of January.

Announcement has been made that the United Illuminating Company, of New Haven, Ct., known at the time of its incorporation last Spring as the New Haven Illuminating Company, will shortly take over the properties of the New Haven Electric Light Company, the Bridgeport Electric Light Company, the Bridgeport Illuminating Company, the Stratford Gas and Electric Company and the Westhaven Power Company. In a short time the United Illuminating Company will take over other companies of a like nature. Overtures have already been made to the New Haven Gas Light Company, and a meeting of the stockholders of the company will be held here soon to consider the proposition. The new deal embraces a proposition to consolidate companies whose combined capital stock is over $1,500,000. The United Illuminating Company was chartered under the state laws last Spring with a minimum capital stock of $200,000. The incorporators were James E. English, president of the New Haven Electric Company; John W. Alling and Herbert C. Warren.

Electric Roads Along Niagara River.

A press dispatch from Toronto, Ont., says that an agreement has been reached between the Fort Erie Electric Railway Company and the Canadian Niagara Falls Park Commissioners, by which the company will be allowed to build an electric line along the Canadian side of the Niagara River, from Fort Erie, opposite Buffalo, to Chippewa, a distance of thirteen miles, where connection will be made with the existing trolley road. This will give Buffalo a trolley service on both banks of the Niagara River to Niagara Falls, and make a belt line between 75 and 100 miles in length.

Telephone News .....and Comment

The Union Telephone Company, of Talbot County, Md., has bought the telephone line from Cambridge to Federalsburg.

President Hudson, of the American Bell Telephone Company, authorizes the statement that the offices will still remain in Boston.

The Southern New England Telephone Company has reduced rates on residence telephones in Winsted, Connecticut, to $6 per annum.

The Postal Telegraph Company is constructing a new line of eight wires to connect with its through service at Chattanooga. This will be the New Orleans and New York line, and will be strictly quadruplex.

The Phœnix telephone plant, of Altoona, Pa., was sold recently, presumably to the big telegraph and cable syndicate recently organized in Philadelphia and New York. The purchase price was $30,000, much more than the par valuation. The new company will assume control at once.

The New England Telephone and Telegraph Company now has 53,000 telephone subscribers, not including between 4,000 and 5,000 in the Southern Massachusetts Company, recently absorbed. Subscribers to the New England Company are increasing at the rate of about 1,000 per month.

The Pacific coast telephone companies made a net gain of 2,108 subscribers in November. Total connected November 30, 62,320; net gain since January 1, 17,335. San Francisco, with a population of approximately 360,000, has 16,455 subscribers; only exceeded in ratio to population by Stockholm.

The Federal Telephone Company, of Cleveland, Ohio, is said to have decided to cooperate with the Telephone and Telegraph Company of America, as soon as the lines of the latter company have been constructed westward to the borders of Ohio. The East is not developed nearly as completely as the Middle West, it is said.

The Southern New England Telephone Company has men removing the antiseptic mouthpieces which have been put on many telephones in New London, Connecticut. The reason of the removal is that the chemicals that render the mouthpieces antiseptic will, in the opinion of the company, corrode the diaphragm in the transmitter.

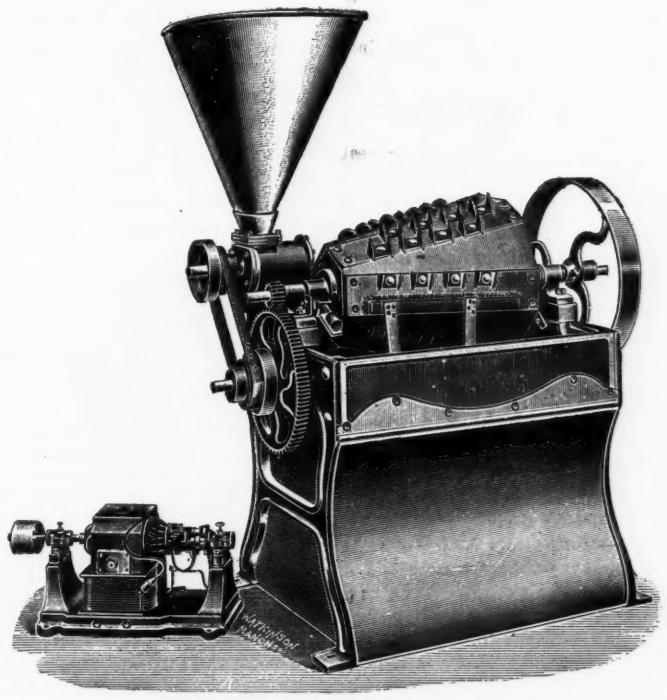
The Rochester, N. Y., Telephone Company, with a capital of $400,000, has been incorporated to construct telephone lines from Rochester to Syracuse, Utica, Oswego, Watertown, Ogdensburg, Buffalo, Niagara Falls, Corning, Elmira and Binghamton. The directors are all Rochester men. Among them are Frederick Cook, George W. Archer, H. W. Davis, Gustave Erbe, J. Foster Warner, Eugene H. Satterlee and William B. Spoder.

The growth of the American Bell Telephone Company is illustrated by the following table showing the gain in the capitalization of the company from year to year:

Year ending June 30	Stock out	Bonds out
1890	$12,500,000	$2,000,000
1891	15,000,000	"
1892	17,500,000	"
1893	20,000,000	"
1894	20,000,000	"
1895	21,500,000	"
1896	23,650,000	"
1897	25,886,300	"
1898	25,886,300	5,049,000

The Erie telephone system reached 100,000 subscribers in November last, and will probably close the year with 105,000. Nestor, the California contract agent, has pledged 60,000 subscribers contracts for construction department work in 1900. The Bell system of the United States, it is announced, will close the year 1899 with 600,000 subscribers, a gain of 122,000. Of this amount Erie system will make one-third of total gain for the year.

The Erie Telephone system made a net gain of 3,787 subscribers in November; total number connected November 30, 102,460; net gain since January 1, 39,717. The Pacific coast telephone companies made a net gain of 2,108 subscribers in November; total number connected November 30, 62,320; net gain since January 1, 17,335; San Francisco with a population of approximately 300,000 has 16,455 subscribers, only exceeded in ratio to population by Stockholm.



AN ELECTROMAGNETIC SEPARATOR.

In the House of Representatives, on December 5, Mr. Corliss, of Michigan, introduced a bill for the laying of a cable to Hawaii, Guam and the Philippines. The cost is limited to $8,000,000, and a preliminary appropriation of $500,000 is made to begin the work. The cable is to be laid under the direction of a commission composed of the Postmaster-General, the chief signal officer of the army and three other members to be appointed by the President. The rates are to be not more than 35 cents a word from San Francisco to Honolulu, and not more than $1 a word to Manila.

In the La Plata, Missouri, Circuit Court Friday night, a case of some importance to the proprietors of country telephone systems was decided. Goodson & Wright, owners of a large farm near New Cambria, sued John Bevan *et al.*, proprietors of the Ethel & New Cambria telephone line, for $100 for the destruction of two large shade trees along the highway, just inside their farm enclosures. Defendants claimed their line was of public utility, and they had a right to remove all obstructions to its operation near the public highway. The jury gave the plaintiffs $12 damages.

In the United States Circuit Court, at Pittsburgh, Pa., a telephone case of no little importance was recently argued before Judge Joseph Buffington. The action was brought by the Western Electric Company, of Chicago, against the Anthracite Telephone Company, of Hazleton, Pa., and involves the validity of a telephone system used on party lines, bridging the magnets at each telephone. The plaintiff company was represented by George P. Barton, of Chicago, and the defendant by Arthur Stewart, of Boston, and B. C. Buckley, of Chicago. The court took the papers.

An Electromagnetic Separator.

The illustration herewith, from an English contemporary, shows an electromagnetic separator for extracting iron and steel particles from borings or other mixtures in which they may be present. In the illustration it is shown with its own dynamo, the power required to drive the combination being about one horse-power actual. The use of electromagnets in place of permanent magnets enables the magnetic force to be kept constant, and also enables the magnetism to be controlled by a patent knock-off motion. By this means the magnets are demagnetized for a portion of each revolution, and the iron collected is allowed to drop into the receiver, thus leaving the magnets free for a new collection. The difficulty of clearing the magnets as was always necessary in the case of permanent magnets is therefore obviated. The improvements thus introduced secure a high output without skilled labor. In the type shown the weight of the separator is 390 lbs., the driving pulley is of 20-inch diameter for a 2½-inch belt, the space occupied 2 feet 6 inches by 3 feet by 4 feet 6 inches high, the daily output 2 tons, and, as we have said, the power required is one horse-power actual. Mr. James F. Butterworth, of 28 Queen street, London, E. C., is placing this separator upon the market.

Wall Street and the Electrical Stock Market.

The stock market throughout the week had a heavy tone and substantial declines were the result of the week's dealings. The investment situation is somewhat hampered by the prevalent monetary conditions. The President's message to Congress, which appeared on Tuesday, did not exercise the favorable speculative effect that had been expected. Wall street, however, is inclined to take a cheerful view regarding the prospective legislation at this session of Congress.

On the New York Stock Exchange General Electric closed to-day at 124 bid and 124½ asked, a loss of 5½ points. Metropolitan Street Railway, of New York, closed at 183½ bid and 184 asked, a loss of 9½ points. Third Avenue Railroad, of New York, closed at 145 bid and 146 asked, a loss of 8 points. Brooklyn Rapid Transit closed at 81¼ bid and 81½ asked, a loss of 5¼ points. Manhattan Railway, of New York, closed at 101¾ bid and 102 asked, a loss of 3¾ points.

On the Boston exchange American Bell Telephone closed at 349 bid and 350 asked, a loss of 5 points. Erie Telephone closed at 105 bid and 106 asked, a loss of 3 points.

On the Philadelphia exchange Union Traction closed at 39¼ bid and 39½ asked, a loss of 2⅛ points. Electric Company of America closed at 13⅝ bid and 13⅞ asked, a loss of ¾ of a point.

On the curb or outside market in New York Electric Vehicle closed at 63 bid and 68 asked, a loss of 7 points. Electric Boat closed at 27½ bid and 29 asked, a gain of 3 points. Electric Axle closed at 6 bid and 6¼ asked, a loss of ⅛ point.

Wall Street, December 9.

Imported Carbons.

It is said that the imported "Ship" carbon made by Messrs. Schiff, Jordan & Company, of Vienna and New York, is being brought into the United States in larger quantities than ever before, and has, within the past few months, received splendid indorsements from several large electric stations as the results of tests and demonstrations for its economy for enclosed arc lighting. The Schiff, Jordan & Company, through their New York branch, are now handling a general line of electrical supplies, particularly electric lighting equipments, and are prepared to make prompt shipments.

BOOK REVIEWS.

"Power Transmitted by Electricity and Applied by the Electric Motor, Including Railway Construction." By Philip Atkinson. Second edition. London and New York, 1899. Cloth, 240 pages, 94 illustrations. Supplied by the ELECTRICAL REVIEW at $2.

This book is an excellent practical treatise upon the essential facts of electrical power generation and transmission, viewed from a practician's standpoint. Historical matter does not figure largely in the work, which is designed as a sort of practical and non-technical book for the instruction of any intelligent person who wishes to understand the workings of electrical machinery. The section on electric railways is excellent. The high reputation of the author is a guarantee of the soundness of the opinions which he occasionally injects into the work.

"Standard Polyphase Apparatus and Systems." By Maurice A. Oudin. New York and London. Cloth, 249 pages, 160 illustrations and many tables. Supplied by the ELECTRICAL REVIEW at $3.

Mr. Oudin has succeeded in making a timely book, and one that will be of use and value to electrical engineers who have been unable to keep up with the rapid advance of the application of alternating current in its numerous forms to practical uses. The book is written from the standpoint of a practician, and contains no unintelligible mathematical formulæ. A short introduction on the general properties of alternating current gives some graphic methods and introduces a few vector diagrams, but, beyond this, the work is a simple and easily comprehended description of typical alternating apparatus, both American and foreign. The tables and diagrams concerning calculations of circuits and transmission lines are especially valuable. The detail of construction of many standard apparatus, dynamos and motors is given with great fullness. As the book is not only timely, but complete to date, its value to the electrical engineering profession, doubtless, will be at once appreciated.

More Underground Trolley Cars in New York.

The Third Avenue Railroad Company, of New York city, started another of its underground trolley lines in operation last Sunday morning. Cars were run from the Fort Lee ferry, *via* 125th street, Manhattan avenue and Amsterdam avenue to Seventieth street. During this week, cars will be operated as far south as Fifty-ninth street, where transfers to the crosstown line will be made.

Bullock Company to Extend Its Plant.

The Bullock Electric Manufacturing Company, of Cincinnati, is advertising for bids to extend 200 feet the main building of its extensive plant at Norwood, Ohio. This will give the company a main machine shop 500 feet long by 101 feet wide. The company has been overwhelmed with orders from all parts of the world during the last six months, and the demand on its facilities has made this extension imperative. The addition to the main building will be made with all possible haste.

The best months' business in the history of the company is the record for November for the Bullock Electric Manufacturing Company. Fifty-one machines were sold. Numerous repeat orders, a most gratifying kind of compliment to the manufacturer, were included among them. The more important sales are enumerated below:

Willson Aluminum Company, Halcombs Rock, Va.; three 600 kilowatts alternating generators.

Manchester *Sporting Chronicle*, Manchester, England; two 150 kilowatts direct-current generators (second order).

L. L. Summers, Florence, Colo.; one 150-kilowatt generator, direct current; one 50-horse-power motor, direct current; two 20-horse-power motors, direct current; two 40-horse-power motors, direct current; one 30-horse-power motor, direct current.

Gould Coupler Company, Depew, N. Y.; two 100 kilowatts generators, direct current.

Jno. Wanamaker, Philadelphia, Pa.; one 100-kilowatt direct-current generator; three 50-horse-power "Teaser" printing press equipments.

Arthur Pearson (*Pearson's Magazine*), London, England; three 50-horse-power "Teaser" printing press equipments.

Oakland Transit Company, Oakland, Cal.; four 15-horse-power, direct-current motors (second order).

American Type Founder's Company, Cincinnati, Ohio; one 30-kilowatt generator (second order).

Pacific Coast Borax Company, Bayonne, N. J.; one 12½-horse-power direct-current motor (fifth order).

Telephone Protective Instruments.

The large number of telephone protective instruments covered by the patents of Messrs. Charles A. Rolfe, of Chicago, and A. Barrett, of Kansas City, are now being manufactured by the Eureka Electric Company, 157 South Canal street, Chicago. Mr. Rolfe will have full charge of this department of the company's work. The instruments include lightning arresters, cable heads, combination protectors, heavy and "sneak" current protectors, cross-connecting boards, and in general, all varieties of devices, employing the principle of heat coil protection. It is said that these instruments are in use on the police and fire-alarm telegraph and telephone lines of more than one hundred of the leading cities of the United States.

American Electrical Apparatus the Best in the World.

A party of foreign capitalists, representing large street railway interests in France and Egypt, is visiting the United States. The members are, M. Montagne, of Paris; a representative of the Enterprise and Electra Company, of Paris and Brussels, and M. Cahen, of Alexandria, Egypt, representing the Alexandrian Tramway Company. They come to the United States to buy rolling stock for electric street railways in France and Egypt. M. Montagne said last week in Cleveland: "We intend to place orders for at least $1,000,000 worth of equipment while we are in America. American made electrical supplies are the best in the world and are extensively used in Europe."

BUSINESS NEWS.

The Sprague Electric Company, on December 16, will remove its offices to Nos. 527 to 531 West Thirty-fourth street, New York city, where they will have larger quarters and better facilities for conducting their large and increasing business.

The demand for telephone instruments of all kinds, recently reported, has resulted, no doubt, quite as much from improvements in the instruments as in the general tendency to decrease cost of same. The energy of the manufacturers in offering inducements has been demonstrated in the high-grade, low-price instruments produced for interior and short-distance work. Now that efficient instruments can be obtained for this work, the field seems almost unlimited, and their improvement is welcomed by thousands who have use for such an instrument. The little instrument made by the L. E. Knott Apparatus Company has been tested during the past six months and found to give excellent satisfaction. An efficient instrument, both transmitter and receiver, mounted on a single base for $1.25, is worth consideration. A small circular issued by the company will be mailed from its Boston office.

RECENT ELECTRICAL PATENTS.

ISSUED NOVEMBER 28, 1899.

637,941 Holder for fuse-wires; A. Peters, Manitou, Colo.—A fuse-wire-holder, comprising a casing having a threaded opening in one end thereof, and a spindle having a threaded end adapted to engage the threads of the perforation and provided at its opposite ends with a flange adapted to seat snugly upon the end of the casing, said spindle being adapted to receive a wire.

637,960 Electrically-operated switch mechanism; S. L. Foster, San Francisco, Cal.

637,979 Incandescent electric light and process of making same; W. L. Voelker, London, England.

637,992 Electric log-recorder; L. T. Jones, Jr., San Francisco, Cal.

638,020 Circuit closing and interrupting device; F. Kuhlo, Berlin, Germany.

638,011 Electric meter; E. S. Halsey, Evanston, Ill.—A maximum electric recorder, consisting of a rotating armature, a rotating drag part, a suitable indicator set rotating with said parts, one portion of said indicator set lagging in its circuit behind another part thereof, in correspondence to the load, thus establishing a maximum indication.

638,036 H. P. White, Philadelphia, Pa.

638,038 Primary battery; H. Blumenberg, Jr., New York, N. Y.

638,039 638,040 638,041 638,042 Battery compound; H. Blumenberg, Jr., New York, N. Y.

638,050 Electric heater; E. E. Gold, New York, N. Y.

638,055 Oscillating meter; A. Lotz, Berlin, Germany.

638,070 Dynamo-electric machine; W. B. Sayers, Bearsden, Scotland—An armature and a field magnet having two or more poles, pairs of reversing pole-pieces arranged between the field-magnet poles and in proximity thereto so as to be magnetized initially thereby, the pole-pieces of each pair being magnetically disconnected from each other.

638,073 Rotary meter; I. Smith, Nottingham, England.

638,083 Chemical generator of electricity; E. L. Anderson, St. Louis, Mo.

638,084 Electrical cutout apparatus; L. Andrews, Hastings, England.

638,085 System of electrical distribution; L. Andrews, Hastings, England.

638,101 Telegraph instrument; J. L. Cutler, Cincinnati, Ohio.

638,110 Starting switch; J. W. Gibbs, Liverpool, England.

638,125 Electric arc lamp; W. C. Johnson, London, England.

638,128 638,129 Electromagnetic ore-separator; Emil Kreuser, Mechernich, Germany.

638,148 Electric belt; A. T. Sanders, New York, N. Y.

638,150 Means for controlling electrically-moved apparatus; G. E. Sautter, Paris, France.

638,152 Telephony; J. S. Stone, Boston, Mass.

638,155 Electric Railway; Elizabeth Warwick, Chicago, Ill.

638,157 System of electrical distribution; Ernest Wilson, London, England.

638,159 Carbon-holder for electric-arc lamps; F. S. Worsely, London, England.

638,160 Electric clock; H. E. Anderson, Stockholm, Sweden.

638,170 Illuminated card sign; G. F. Bostwick, New York, N. Y.

638,186 Surface contact electric railway; J. Robertson, Jr., Uddingston, Scotland.

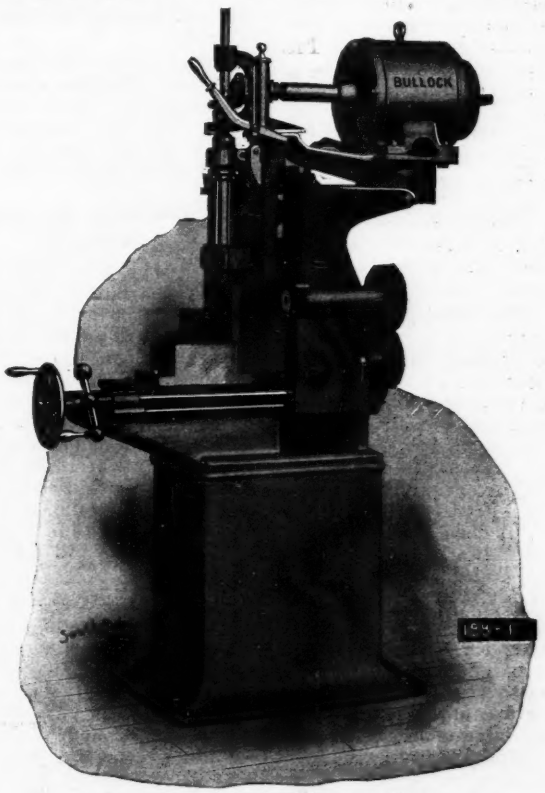
638,199 Electric switch; F. A Merrick, Johnstown, Pa.

TRENTON, N. J.—Articles of incorporation have been filed by the United Water, Gas and Electric Company, capital $500,000, to manufacture and furnish gas, electric light, heat and power, to construct reservoirs and furnish water, and to construct railways and tramways operated by any kind of power.

A Neat Application of Electric Power.

A profiler is a difficult machine in which to directly apply an electric motor without intermediate belting, owing to the fact that the distance between motor and spindle varies by reason of the constant shifting of the carriage.

To surmount the difficulty of a constantly changing length of shaft, the Bullock Electric Manufacturing Company, place the motor upon a revolving base, and connect the motor and spindle by a splined shaft and sleeve. The shaft sliding within the sleeve allows for the variable distance between motor and spindle.



A NEAT APPLICATION OF ELECTRIC POWER.

The motor is described in Bulletin No. 0735 which may be had by addressing the companies at Cincinnati, Ohio.

Meeting of the American Society of Mechanical Engineers.

On Tuesday evening, December 5, the American Society of Mechanical Engineers held the first session of one of its semi-annual meetings in its house in New York city. The president, Rear Admiral G. W. Melville, U. S. N., read an address on Engineering in the United States Navy—Its Personnel and Material, at this session. Wednesday and Thursday were devoted to the reading and discussion of papers, and on Thursday evening a reception to visiting members was given at Sherry's. This very enjoyable gathering was largely attended. On Friday morning a closing session disposed of various business matters and a few remaining papers. The meeting was one of the best attended in the history of the society, and many of the papers were of high value.

X-Ray Tubes With Artificially Cooled Apparatus.

In "Science Brevities," in the issue of the ELECTRICAL REVIEW for December 6, was a note on an X-ray tube having a water-cooled anode, presented to the French Academy by MM. Buguet and Chabaud. Dr. W. Rollins states that he made such a tube in 1896, and that it has been in use in the Boston City Hospital for over two years. Messrs. Oelling & Heinze, of Boston, made it commercially available. The results given by it are said to be remarkably satisfactory, and the tubes are now in use in a number of hospitals, as well as by many independent practitioners. This firm deserves great credit for the high state of perfection to which it has carried the artificially cooled target tube, which is capable of a much higher degree of excitation than the usual type.

The Direction of Electrical Advance.

"I consider the most interesting development in electrical science," said the President of the General Electric Company in a recent conversation with a member of the ELECTRICAL REVIEW staff, "is the use of electricity in metallurgy, and in the production of carbides, carborundum and new products of this character. These new industries have grown up in the last few years, resulting in three new products of great value to the arts—aluminum, carborundum and the carbides. The manufacture of many chemical products has undergone a revolution, and such substances as alcohol, quinine and other drugs, and many chemical products used in manufacture, have been cheapened and bettered by the use of electrolytic methods. The enterprising men of the electrical journals should, in my opinion, carefully watch the progress of electrolytic industries, which I consider the most interesting and promising in the whole field of the application of electricity.

"There is also a rapidly growing development in the extension of the use of the storage battery, and especially in its application to electromobiles. This latter use will be of great benefit to central lighting and power stations in the large consumption of current in charging the batteries of electric vehicles.

"As the cost of producing electric current becomes less," he continued, "its use in cooking, heating, ventilation, refrigeration, and for other domestic power applications will, no doubt, be gradually and permanently extended." The excellent work done by the representative technical press of the country, in advancing the interests of the electrical industry of the country, was also referred to in terms of high commendation.

A Beautiful Catalogue.

One of the handsomest catalogues issued this year is that of the Ridgway Dynamo and Engine Company, of Ridgway, Pa., the builders of the Thompson-Ryan dynamo and the McEwen engine. It is a volume of 104 large pages, bound in limp boards, and is superbly illustrated. The drawings and photographic reproductions of the various details of engines and dynamos are so numerous and satisfactory that they practically serve the purpose of a sample machine, in so far as showing construction and type is concerned. The Ridgway Company is to be congratulated upon this highly artistic publication.

ADVANCE INFORMATION

Electric Light and Power.

NEW WILMINGTON, PA.—W. J. Shields, of New Wilmington, Pa., is working on the final drawings for a new electric lighting plant, to be erected at the same place the early part of next Spring. It will embrace a power house and cost about $5,000. G. H. Getty, president of the Council, is at the head of the project.

SOUTH BETHLEHEM, PA.—A movement is on foot to incorporate a local electric light company.

BROOKLYN, N. Y.—It is reported that the Edison Electric Illuminating Company, of Brooklyn, will soon issue 4 per cent bonds to the amount of $1,000,000 to pay for extensions and betterments, and also for the Amsterdam Electric Light, Heat and Power Company's plant and franchise.

BRIDGETON, PA.—The Bridgeton & Millville Traction Company has begun the work of erecting a large new building in the centre of the city, in which their power house and the electric lighting plant, which is now controlled by them, will be consolidated.

MILTON, MASS.—The addition to the Milton Electric Light Company's plant is nearly completed.

BELVIDERE, WIS.—The plant of the Belvidere Electric Light and Power Company will soon pass into the hands of Chicago parties who have been negotiating for it for some time.

ALTOONA, PA.—The Edison electric light plant of Altoona has been sold by the Electric Company of America, at New York, to a Philadelphia electric combine. Over $1,000,000 changed hands in the transaction. The new purchasers have also secured control of the trolley lines and gas plant in Altoona.

PRATTVILLE, ALA.—Prattville is discussing a new system of street lighting.

DOVER, DEL.—The Trenton Company, of Chicago, has been incorporated for the operating of water and electric light works; capital, $250,000.

KOKOMO, IND.—As a result of a recent advance in the price of electric lighting, a meeting of Kokomo merchants was held last week to organize the Merchants' Mutual Light Company.

YONKERS, N. Y.—Mayor Sutherland's annual message to the Common Council contains a recommendation that the city should own and operate its own lighting plant. He said that municipal ownership should begin with the expiry next year of the contract with the present company.

KANSAS CITY, MO.—The problem of electric lighting for Kansas City has been revived for discussion by the request of the Home Electric Lighting Company for a franchise.

WILDWOOD, N. J.—The Seacoast Electric Light Company, of Five Mile Beach, has been reorganized, and the new management promises to soon light this place and Holly Beach and also build a trolley road along the island.

ESSEX FALLS, N. J.—The Essex Falls Electric Light and Water Company, principal office, Essex Falls, Essex County, N. J., has been formed to furnish electricity for light, etc. Capital, $10,000; incorporators, Herman Wendell, Frederick H. Treat, of Wayne, Delaware County, Pa.; Charles O. A. Maule, Essex Falls, Essex County, N. J.

TRENTON, N. J.—The Columbus Electric Light Company, which will furnish electric light to southern towns, has been incorporated in the office of the New Jersey Corporation Agency, Jersey City. Papers have been filed in Trenton. The capital of the company is placed at $800,000, with these incorporators: Albert McMahon, John J. Mulvany and Charles N. King.

New Electric Railways.

DANVILLE, N. Y.—The Danville Street Railway and Light Company has been formed to furnish electricity for all purposes; capital, $700,000; incorporators, F. Lindley, A. R. Samuel, O. W. Cannon, all of Danville.

CHARLESTON, W. VA.—Articles of incorporation have been obtained here by the Clarksburg Street Railway Company, which proposes to construct a street car line at that place. The company is composed of Virgil H. Highland, Frank B. Haymaker, Sherman C. Denham, Marcellus M. Thompson and Leonard Peck, all of Clarksburg. The subscribed capital is $600, 10 per cent paid up, and authorized capital of $500,000.

LOUISVILLE, KY.—The Louisville Street Railway Company is contemplating extensive improvements in its lines and service during the new year, and when the improvements are made Louisville will have not only a modern and up to-date railway in every particular, but will have one that will compare favorably with the larger lines in other cities.

LATROBE, PA.—A company composed of Capt. James M. Peters, John B. Anderson, Joseph Head, Dr. J. W. Hughes, and others, with a capital of $45,000, is to construct an electric railway line eight miles long, beginning at the corner of Depot and Ligionier streets and running to Youngstown, Baagaley, Whitney and Lippencott, with a branch to Dorothy coke works.

DANVERS, MASS.—Work has begun in earnest on the construction of the Middleton & Danvers Electric Railway, with a large force of men. It has been delayed because the rails and other materials could not be obtained sooner.

NEWBURYPORT, MASS.—The Citizens' Street Railway Company held its annual meeting last week, when E. R. McPherson, of Boston; A. B. Bruce, of Lawrence; H. Fisher Eldredge, of Portsmouth; A. D. Besson, of Chelsea; E. P. Shaw, Jr., of Brookline; Phineas W. Sprague, Albert C. Titcomb. of Newburyport, and George A. Marden, of Malden, were elected directors.

FREDERICK, MD.—A preliminary survey for the proposed Frederick, Liberty & Emmitsburg Electric Railroad has been made between Frederick and Liberty, and from the latter point will be continued to Woodsboro. It is not intended to go beyond the latter point at present, the object being to construct a railway which will give transportation facilities to the towns of Mount Pleasant and Liberty and the interlying country. The line surveyed follows the Frederick and Liberty turnpike most of the way.

TOLEDO, OHIO—The Northeastern & Eastern Railway Company has been formed to operate a railroad; capital, $50,000; incorporators, J. Caldwell, W. Sheridan, F. C. Stulz, H. A. Conlin, C. C. Wilson.

New Telephone and Telegraph Companies.

MILWAUKEE, WIS.—The American Wireless Telegraph Company, with a capital of $1,000,000, will soon be organized in Milwaukee to own and operate the patent rights of the wireless telegraph instruments invented by W. S. Johnson and Charles E. Fortier, of this city. The company will have its headquarters and factories in Milwaukee. Mr. Johnson's recent trip to Buffalo and New York was to interest capitalists in his instruments, and within a short time their manufacture will begin in this city.

FALL RIVER, MASS.—A call has been issued for a meeting, to organize a new local telephone corporation, to be called the Fall River Automatic Telephone Company, with a capital stock of $135,000. The Hon. R. T. Davis, ex-Mayor Coughlin, President R. J. Thompson, of the board of trade, and other prominent men head the list of incorporators. The company will use an automatic system if a franchise is granted.

COLUMBUS, OHIO—The Putnam Telephone Company, of Ottawa, has been formed to operate a telephone line; capital, $40,000; incorporators, W. H. Harper, O. C. Handy, F. H. Wolf, J. T. Bisser, G. W. Bisser.

ALBION, NEB.—The Albion Telephone Company has been formed to erect and construct a telephone line; capital, $4,000; incorporators, A. Harris, M. G. Needham, T. F. Marlens, all of Albion.

KALAMAZOO, MICH.—The Central Telephone Company, which operates 2,000 miles of toll-lines and ten exchanges in southwestern Michigan, has increased its capital from $100,000 to $500,000. They will immediately extend the scope of the company's territory, and make marked improvements in the service. A direct line is being built to Jackson. Charles H. Seitz, formerly of Detroit, was chosen general manager.

GUTHRIE, OKLA.—A charter has been granted by the Secretary of State to the Independent Telephone Company, of Enid.; capital stock, $5,000; incorporators, George E. Holdredge, George W. Welsh and Charles J. West.

SENNETT, N. Y.—The Sennett Telephone Company has been formed to operate in Sennett and Weedsport, Cayuga county; Eldridge and Jordan, and other towns in Onandaga and Cayuga Counties; capital $500; directors, H. C. Crocker, S. C. Depew and Walter E. Spurr, of Sennett, Cayuga County.

WEST ONEONTA, N. Y.—The Butternut Valley Telephone Company, of Otsego County, to maintain lines in Gilbertsville, Maple Grove, Morris and other villages in the county, with terminus at West Oneonta has been formed; capital, $3,500; directors, G. C. Peck, E. E. Steele, New Lisbon; W. F. Ward, E. C. Brewer, Gilbertsville; Frank Hull, Jas. Martindale, George Williams, of Morris.

New Incorporations.

NEWARK, N. J.—Articles of incorporation of the Murphy Safety Third Rail Electric Company, which has a capital stock of $2,500,000, have been recorded. It will equip railroads and vehicles with electrical power and apparatus, "or other power," and may build central stations for the generation of electricity. The capital stock is divided into 25,000 shares, of which 12,500 shares will be preferred stock. The amount paid in is $3,500. Matthias Plum, Alexander Beach, William M. Keepers, of this city; George H. Carey, John B. Renwick, of Brooklyn; Lauron Ingels, of New York, and Charles T. Hayman, of Cincinnati, are the incorporators. They each hold $500 worth of common stock. The principal office of the company in this state will be in this city.

CHICAGO, ILL.—The International Electrical Indicator Company has been formed; capital stock, $15,000; incorporators, F. E. Davidson, John P. Martin and Edward A. DeLasaux.

CHICAGO, ILL.—Karas Electric Manufacturing Company, Chicago; capital, $15,000; general electric manufacturing; incorporators, Joseph Karas, V. T. Kissinger, R. Buhrke.

LOS ANGELES, CAL.—Electrozone Manufacturing Company, to manufacture electrozone; capital, $150,000; incorporators, A. G. Hall, B. White, D. C. Burrey, H. M. Johnson, C. A. Cole, all of Los Angeles.

Increase of Capital.

CHICAGO, ILL.—Kellogg Switchboard and Supply Company, Chicago; capital stock increased from $250,000 to $500,000.

TROY, N. Y.—The capital stock of the Halfmoon Light, Heat and Power Company has been increased from $20,000 to $50,000. A certificate to that effect has been filed with the Secretary of State.

Kindred.... ...Interests

The Electric Appliance Company, Chicago, have issued pamphlets describing the different styles of Adams–Bagnall enclosed arc lamps.

Kendrick & Davis, Lebanon, N. H., successors to the Porter Standard Motor Company, have issued an illustrated catalogue of their motors, fans, dry batteries, screw drivers and "pin" vises.

The construction department of the Western Electric Company, Chicago, has closed a contract for wiring 3,600 lights and erecting two switchboards for the McCormick harvester works, of Chicago.

Four 60,000-volt transformers, each weighing five tons, have been shipped by the Stanley Electric Manufacturing Company, Pittsfield, Mass., to a long-distance power transmission company in Sacramento, Cal.

The United Electric Heating Company, 260 Randolph street, Detroit, Mich., has issued an illustrated price-list of the "United" electric heating devices and supplies. The price-list will be mailed free on application.

The American Endoscopic Company, of Providence, R. I., announces the publication of a new catalogue. This company manufactures many beautiful designs of incandescent lamps, and the catalogue is handsomely illustrated.

The Hazard Manufacturing Company, of Wilkesbarre, Pa., has brought out a very neat catalogue of its wire, bare and insulated, cables, wire rope, etc. The tabulated information given about the various manufactures is the kind that a practical buyer appreciates, such as the weights per given lengths, over-all diameter of wires and cables, etc.

Farr Telephone and Construction Supply Company, of Chicago, have recently issued a small pocket catalogue giving a full list of sundries used by electric light plants, which will be sent free on application. They have recently gotten out a new telephone hand-book and catalogue of information, which will be sent free. Address them at 357 Dearborn street.

A particularly handsome series of illustrated catalogues have been received, sent out by the Central Electric Company, of Chicago. These cover copper and iron wire, bare and insulated; Knapp annunciators, "durable, effective and ornamental;" telephone construction material and tools and "Duplex" lamp guards. Users of these materials should promptly send for these booklets.

The New York & Ohio Company, Warren, Ohio, have arranged to reproduce twelve famous pictures in miniature during the year 1900, each having the calendar for the month. The first of the number is a reproduction of the painting "Lost In Thought." The company wish it announced that they will enter all names for the series on receipt of business card, or the names of those who might have an interest in Packard incandescent lamps and transformers.

The Standard Underground Cable Company, of Pittsburgh, are justly elated over the fact that the National Export Exposition, recently held at Philadelphia, awarded them a silver medal, a diploma and the "Blue Ribbon," being the highest honors awarded to any manufacturers' exhibit. The award was made for "the most complete exhibit ever made" of submarine cables, telephone cables, power cables, both for alternating and direct current; high-pressure and low-pressure cables, street railway cables and high-grade rubber-insulated wires, and the completeness of their working models, showing the detail of the accessories for connecting up and operating the same.

The Michigan Electric Company, of Detroit, Mich., announce that their supply business of this year is showing a phenomenal increase over the business of previous years. The amount of business they have done during the first nine months of this year is nearly double the amount done during the corresponding months of 1898. This is due, they believe, partly to the general improvement in all business, and partly to the fact that their quarters are now much better adapted to the needs of their business, and make a much more attractive display than they did before their fire in September of 1898, their handsome store having been a special factor in attracting new customers and increasing their business.

The Western Electric Company has issued a neat circular describing the pendant push-button switch. The purpose of these switches is to connect chandeliers, fan motors, or other devices with the switch by means of a drop cord, allowing the switch to hang within easy reach. They are made in two sizes; *viz*, five amperes and 10 amperes. This company has recently issued a small four-page bulletin on annunciators, in which is given a list of their latest D style hotel annunciators and return-call push-button board. There are also listed a line of smaller annunciators and elevator annunciators. This bulletin is numbered 22A. If our readers wish any of the same, they should write for Bulletin 22A.

The Elmira (N. Y.) & Seneca Lake Electric Railway have been petitioned by the fruit growers along the Hector Lake road to extend the lines down the eastern shores of Seneca Lake. The growers will pledge to ship all their fruit over the line, which would exceed 1,000 tons, making a traffic net of about $3,000 in two months.

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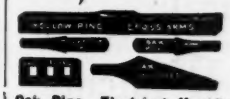

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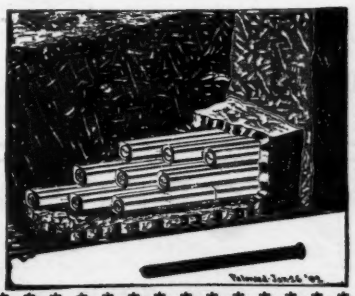

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[Specially reported for this journal by E. G. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 28, 1899.

637,766 Means for driving dynamos from car-axles; J. D. Creveling, New York, N. Y.—A truck, a rotary axle, a fixed and movable sheave upon the axle, a dynamo and armature-shaft, a fixed sheave upon the armature-shaft, an idler pivotally supported so as to leave a clear space between it and said fixed sheave, and an endless belt passing from the armature-sheave to the idler against the axle-sheaves, and in operative contact with each sheave.

637,773 Constant-current transformer; R. Fleming, Lynn, Mass.—Two inductively related coils mounted so as to have a tendency to move in one direction relatively to each other and means for partially counteracting said tendency by fluid pressure.

637,778 Electromagnetic instrument; G. E. L. Grabe, Berlin, Germany—Consists of an electromagnet, a closed casing for containing the same, a diaphragm of yielding material forming a part of the said casing, an armature for the said magnet carried by the said diaphragm, and a vibrating member carried by the diaphragm upon the exterior of the casing.

637,785 Protecting static voltmeters; E. M. Hewlett, Schenectady, N. Y.—Consists of an electrostatic instrument, an impedance in series relation thereto and to the source of energy, said impedance being sufficiently high to prevent the maintenance of an arc if the potential rise sufficiently to leap the air gap between the fixed and movable members.

637,789 Combined relay and distributer; K. Himrod, Chicago, Ill.—A relay comprising a permanent magnet, two neutralizing-coils, the downturned pole-pieces and the armature normally maintained almost in contact with the pole-pieces and movable toward the coils.

637,794 Lightning-arrester; T. B. Hughes, Hawes' Crossroads, Tenn.

637,806 Pneumatically operated contact-shoe for electric railways; S. H. Libby, Schenectady, N. Y.—Consists of a traveling vehicle, of electric motors thereon, a contact-rail, a contact-shoe carried by the vehicle and adapted to make electrical connection between said rail and motors, and pneumatic motor for moving the shoe out of contact with the rail.

637,819 System of distributing alternating currents; E. G. P. Oelschlager, Westend, Germany.

637,828 System of electrical distribution; E. B. W. Reichel, Berlin, Germany.

637,833 Electrohygienic apparatus; A. Schneider, Chicago, Ill.—An exerciser comprising a movable electrode and retracting resistance, a source of electricity generated independently of the exerciser, and automatic means for producing momentary pulsations of current through said electrode.

637,846 Electrical and selective signaling; J. A. Barrett, Summit, N. J.—Consists of an electromagnet and armature, a condenser in series with the said electromagnet, a normally open or discontinuous shunt around the said electromagnet and condenser, and means for closing the said shunt when the said armature actuated by the said magnet is moved from its normal or resting position in the field thereof.

637,851 Liquid-feed device for electrolytic or kindred apparatus; H. Carmichael, Malden, Mass.

637,873 Apparatus for indicating direction of rotation or motors; H. Kahler, Hamburg, Germany—A motion-indicator composed of a pair of contact-arms, adapted to be oscillated by a motor, a lever set by the shifting-gear, an indicator, and electric connections between the indicator, lever and contact-arms.

637,884 Telephone circuit; J. J. Muller, Kiel, Germany.

637,886 Electric arc lamp; G. L. Moyer, Hartford, Ct.

637,890 Electrical cut-out; C. G. Perkins, Hartford, Ct.

637,891 Fusible plug; C. G. Perkins, Hartford, Ct.

637,892 Electric switch; C. G. Perkins, Hartford, Ct.

637,894 Terminal head box; H. E. Procounier, Chicago, Ill.—An enclosure for an electric terminal head consisting of a plate on which the terminal head is mounted, and a channel-sheath having lateral slide-bearing engagements with the plate.

637,905 Changeable electric-light sign; Hermann Tripp; Chicago, Ill.—A backing consisting of sections provided with slots, conductors in line with the slots, and letters provided with contacts passing through the slots and securing the letters to the backing and conductors.

637,914 Electric alarm system and apparatus for testing same; E. P. Woodman, Boston, Mass.

(Continued on page 385.)

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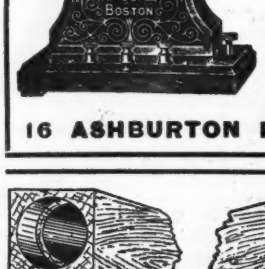

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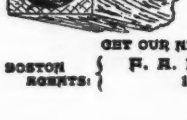

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